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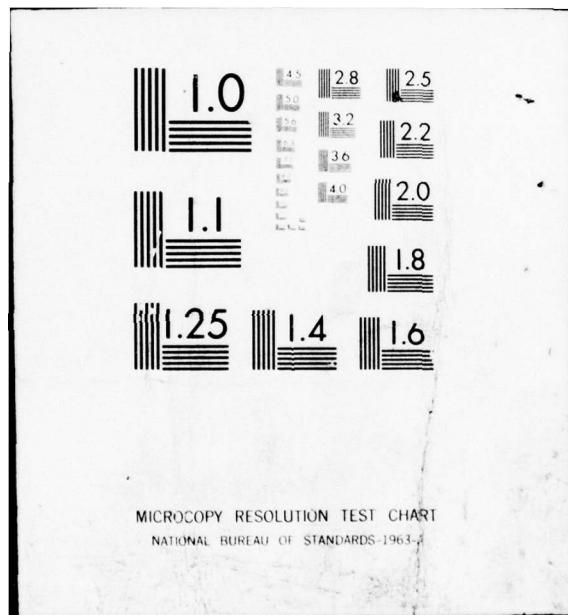
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⑨ data report.

⑥ PHYSICAL AND CHEMICAL DATA

CIRCE EXPEDITION

16 March - 1 December 1968

⑭ SIO-REF-77-32

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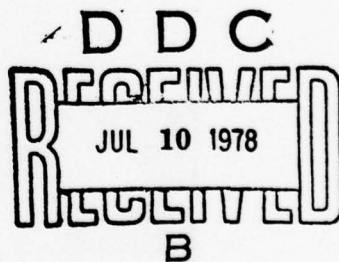
CIRCE EXPEDITION

16 March - 1 December 1968

Sponsored by

National Science Foundation

Office of Naval Research



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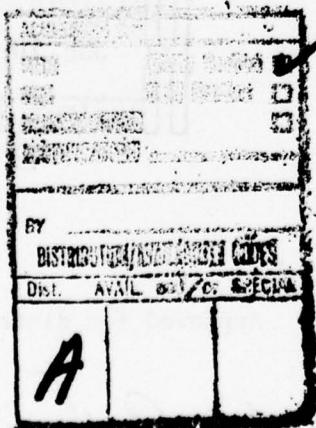
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## INTRODUCTION

CIRCE Expedition was primarily a deep-sea geological-geophysical cruise, with the work on Legs I and II consisting mainly of seismic reflection surveys and bottom sampling by core and dredge.

CIRCE Expedition, Legs VIII and IX, had three major objectives and several satellite programs; they were mainly geological and geochemical in orientation:

1) An examination of a portion of the Walvis Ridge off western South Africa with standard geophysical and geological methods to develop hypotheses regarding the origin of this aseismic ridge which has been variously considered a volcanic chain, an ancient fracture zone complex and an old plate boundary with a low rate of convergence and which has an obvious but not yet understood significance for the opening of the South Atlantic.

2) A sedimentological and geochemical study of the recent sediments and their overlying waters on the continental margin near Walvis Bay. Deposits of very high organic content have long been known to accumulate in this area, and various investigators have regarded them as precursors of organic metal-bearing shales of the Kupferschiefer type. One of the purposes of this cruise was to establish the nature and regional distribution of these sediments, relate their composition to overlying waters and circulation, and determine their composition and possible content of heavy metals and trace elements. This included a hydrographic and nutrient survey in the inner part of the Benguela Current with particular reference to upwelling and the composition (nutrient and oxygen contents) of the bottom water on the shelf.

3) Surveying a geophysical and geological traverse of the Mid-Atlantic Ridge at a mid-southern latitude where, so far, very little information exists. This traverse, supplemented with detailed area surveys in five locations was designed to provide further information on the origin of the crestal zone of the Ridge and associated fracture zones and on the evolution of the Ridge structure and relief with increasing distance from the Ridge axis. Magnetic observations and reflection profiling were continuous; bathymetric observations were made continuously when possible. Some plankton tows were made.

In addition, supplementary programs included a series of casts of a large-volume water sampler for a long-term study of radioactive fallout in the oceans for Woods Hole Oceanographic Institution (WHOI), a program of trace element studies of seawater for the University of Capetown, and a study of the alkalinity of Atlantic intermediate and deep water by Scripps Institution. Large volumes of seawater (surface to bottom) were collected at 5 stations on Leg VIII and at 4 stations on Leg IX, as well as at 9 other points from the surface only. These were analyzed for carbon 14 by Dr. J. C. Vogel, National Physical Research Laboratory, Pretoria, South Africa; for such fallout nuclides as strontium 90, cesium 137 and plutonium 238 and 239 by Dr. V. T. Bowen, WHOI; and aliquots were collected for later analysis for tritium by Dr. W. Roether, University of Heidelberg, Germany. This was a part of a continuing program using long-lived artificial radionuclides for the study of water or particle movement in the Atlantic Ocean.

The main programs were the responsibility of Oregon State University with collaboration from the University of Edinburgh, Scotland, for item 2).

Legs VIII and IX of CIRCE Expedition were supported by the Office of Naval Research. Supplementary funding for the main program came from a grant of the National Science Foundation to Oregon State University and for the fallout study from a contract of the Atomic Energy Commission with Woods Hole Oceanographic Institution. Further funding was provided by the South African Council for Scientific and Industrial Research, the Carnegie Trust for the Universities of Scotland, and International Nickel.

#### STANDARD PROCEDURES

The data presented in this report were collected on CIRCE Expedition Legs I, II, VIII and IX. The data were obtained from Nansen bottle casts and were collected and processed primarily by the Data Collection and Processing Group (DCPG, MLRG), Scripps Institution of Oceanography, University of California at San Diego.

The table below summarizes the hydrographic work completed on CIRCE:

<u>Leg</u>	<u>No. of Stations</u>	<u>Casts</u>	<u>Total No. of Bottles</u>	<u>Maximum Depth</u>
I	1	single	6	within 350m of bottom
II	4	single	5	within 350m of bottom
VIII	19	single	4-16	less than 350m
	1	single	21	~1500m
	5	multiple	22-51	bottom
IX	3	single	22	~1500m
	5	multiple	44-65	bottom

#### Hydrographic Casts

Temperature was measured with paired deep-sea reversing thermometers and is tabulated to hundredths of a Celsius degree. In some instances, however, specially scaled thermometers were used; these values are recorded to thousandths of a degree. Unprotected thermometers were included in most bottles lowered deeper than 100 meters.

Water samples for chemical and nutrient analyses were obtained from the Nansen bottles.

Salinity was determined with a conductive salinometer (Univ. of Wash., 1960). The values are recorded to three decimal places, provided

accepted standards are met. Salinity is recorded to two decimal places when only one determination per sample was obtained or where there is doubt about the accuracy of a particular sample or of all samples on a station.

Dissolved oxygen was determined by the Winkler method as revised by Carpenter (1965).

Reactive phosphate was determined by the method of Murphy and Riley (1960); reactive silicate by the method of Strickland and Parsons (1965); nitrate by the method of Wood et al. (1967); and nitrite by the method of Bendschneider and Robinson (1952).

The nutrient analyses on Leg VIII and subsequent processing were done by S. E. Calvert and N. B. Price, University of Edinburgh. Questions concerning these data should be directed to them.

Silicate data from Leg IX, stations 245 and 246, have been cited in Edmond and Anderson (1971). The silicate values used were calculated incorrectly, being about half what they should be. The correct values are tabulated in this report.

The observed data have been evaluated using the method described by Klein (1973). This involves consideration of their variation as functions of density or depth and their relations to each other, and comparison with previous or adjacent observations.

#### TABULATED DATA

Nansen bottle data are listed with observed values on the left side of the page and with interpolated and calculated values at standard depths on the right side of the page. The values listed at standard depths are computer interpolations according to a modified Rattray (1962) technique.

The time given for bottle casts is that of the messenger release in Greenwich Mean Time. When more than one cast was lowered on a station, the times for the first and last casts are given. The observed depths of multiple casts are footnoted except for the cast which includes the shallowest Nansen bottle.

The bottom depth, listed in meters, was determined by applying corrections from Matthews (1939) tables to echo soundings.

The weather and dominant waves are coded using the National Oceanographic Data Center (NODC) method.

78 06 08 010

The column headings from the computer are explained as follows:

Z	Depth	Meters
T	Temperature	°C
S	Salinity	‰
O2	Dissolved oxygen	ml/L
P04	"Reactive" inorganic phosphate-phosphorus	µg at/L
Si03	"Reactive" inorganic silicate-silicon	µg at/L
N02	"Reactive" nitrite-nitrogen	µg at/L
N03	"Reactive" nitrate-nitrogen	µg at/L
DT	Thermsteric anomaly	cl/ton
SIGT	$\sigma_t = (\rho_{s,t,0} - 1)10^3$ where $\rho_{s,t,0}$ is the density the parcel would have if moved isothermally to the sea surface.	g/L
DD	Geopotential anomaly, referred to the sea surface.	dyn. meters

#### FOOTNOTES

Data which appears to be in error without obvious reason is reported, but flagged uncertain with a U. Such data was not used in the determination of values at standard depths. Footnotes are used to indicate data which has required special processing.

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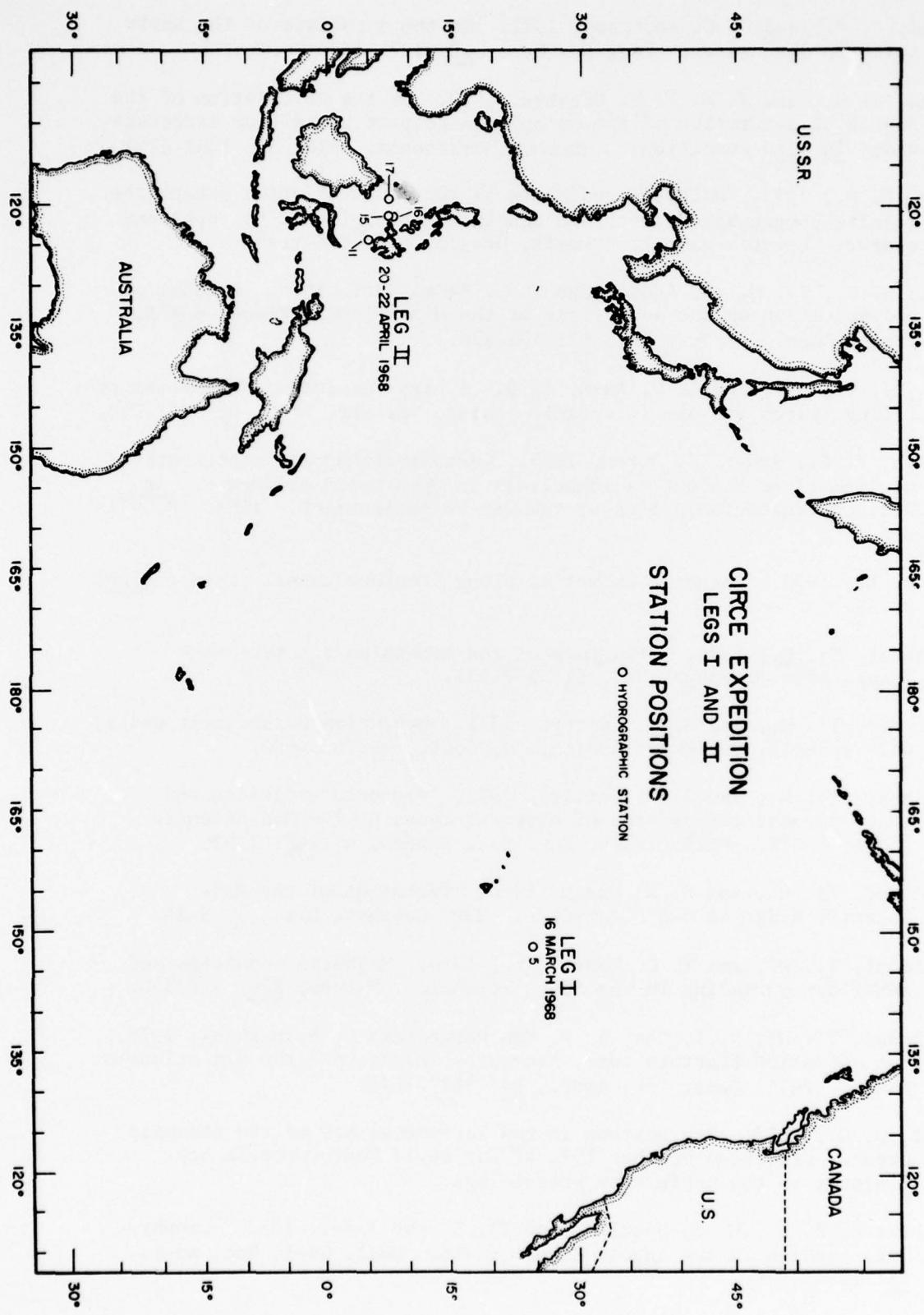


FIGURE 1

PERSONNEL  
CIRCE Expedition I and II

SHIP'S CAPTAIN

Phinney, Alan W. RV Argo, Legs I and II

PERSONNEL PARTICIPATING IN THE COLLECTION OF DATA

<u>RV ARGO</u>	<u>Participation (Leg)</u>
Shor, G. G., Jr., SIO*, Chief Scientist	I
Karig, D. E., SIO " "	II
Abbott, J. L., SIO	I
Bach, J. E., SIO	I, II
Busch, R. J., U.S. Naval Oceanographic Office	II
Cornelius, J. F., International Business Machines	I, II
Dixon, F. S., SIO	I
Donovan, J. T., SIO	I
Earl, J. L., SIO	I, II
Edmond, J. M., SIO	I, II
Francheteau, J., SIO	II
Johnson, B. P., SIO	I
Jones, A. C., SIO	I
Kishii, T., Maizuru Marine Observatory	II
Kolesnikow, V., SIO	II
Kroopnick, P., SIO	I
Lee, J., Loyola University	I
Lucas, J. C., SIO	I
Morris, G. S., Jr., SIO	I
Mudie, J. D., SIO	I
Nagasaki, K., Maizuru Marine Observatory	II
Newhouse, D. A., SIO	I
Osborn, T., SIO	I
Pine, J. S., SIO	I, II
Rowe, R. A., SIO	I, II
Samora, F. E., SIO	I, II
Smith, M. V., Volunteer	I, II
Smith, W. L., SIO	I, II

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\* Scripps Institution of Oceanography

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RV ARGO

CIRCE EXPEDITION I

5

LATITUDE 24 38.8N	LONGITUDE 148 13.0W	MO/DAY/YR 03/16/68	MESSENDER TIME 0020	BOTTOM 5350M	WIND 060	SPEED 06KT	WEATHER 2	DOMINANT WAVES 060 06 05
Z	T	S	02	P04	S103	N02	N03	DT
339A	10.18	34.138	4.81					176.1
3244	1.52	34.680	3.33					33.4
3714		34.689	3.53					
4181		34.778	3.53					
4648		34.719	1.69					
5117	1.48	34.696	3.94					31.9

A) THE DEPTHS ARE UNCERTAIN BECAUSE THE CAST WAS TAKEN WITH THE HEAT FLOW PROBE.  
THIS IS HEAT FLOW PROBE LOWERING ONE (HF-1).

## RV ARGO

## CIRCE EXPEDITION II

11

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES
5 15.3N	124 32.0E	04/20/68	0658	5771M		KT		
Z	T	S	D2	PD4	S103	N02	N03	DT
3540A	3.64	34.596	2.24					57.1
3973		34.593	2.27					
4451		34.592	2.27					
4935		34.596	2.28					
5415	3.86	34.593	2.32					59.4

## RV ARGO

## CIRCE EXPEDITION II

15

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES
7 40.0N	121 28.0E	04/21/68	1920	4974M		KT		
Z	T	S	D2	PD4	S103	N02	N03	DT
2900B	10.23	34.465	1.63U					152.7
3388		34.462	1.52					
3876	10.40	34.463	1.51					155.7
4364		34.462	1.52					
4852		34.459	1.70U					

## RV ARGO

## CIRCE EXPEDITION II

16

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES
7 40.0N	121 34.0E	04/22/68	1305	4292M		KT		
Z	T	S	D2	PD4	S103	N02	N03	DT
2226C	10.16	34.455	1.51					152.3
2717	10.24	34.461	1.45					153.2
3204	10.32	34.465	1.44					154.2
3701	10.40	34.463	1.47					155.7
4203	10.48	34.460	1.54					157.2

## RV ARGO

## CIRCE EXPEDITION II

17

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES
7 43.0N	119 35.0E	04/22/68	2342	3677M		KT		
Z	T	S	D2	PD4	S103	N02	N03	DT
1634D	10.10	34.450	1.56					151.7
2097	10.14	34.468U	1.50					
2573	10.23	34.456U	1.43					
3054	10.29	34.459	1.44					154.1
3547	10.37	34.457	1.48					155.6

- A) THE DEPTHS ARE UNCERTAIN BECAUSE THE CAST WAS TAKEN WITH THE HEAT FLOW PROBE AND HAD ONLY ONE THERMOMETRIC DEPTH.  
 THIS IS HEAT FLOW PROBE LOWERING FOUR (HF-4).
- B) THE DEPTHS ARE UNCERTAIN BECAUSE THE CAST WAS TAKEN WITH THE HEAT FLOW PROBE AND HAD ONLY ONE THERMOMETRIC DEPTH. THE DEPTHS HAVE BEEN COMPUTED USING THE CORRECTED PDR SOUNDING, THE DISTANCE BETWEEN THE BOTTOM AND THE PINGER, AND THE SPACING BETWEEN THE NANSEN BOTTLES AND THE PINGER.  
 THIS IS HEAT FLOW PROBE LOWERING SEVEN (HF-7).
- C) THE DEPTHS ARE UNCERTAIN BECAUSE THE CAST WAS TAKEN WITH THE HEAT FLOW PROBE.  
 THIS IS HEAT FLOW PROBE LOWERING EIGHT (HF-8).
- U) THE DEPTHS ARE UNCERTAIN BECAUSE THE CAST WAS TAKEN WITH THE HEAT FLOW PROBE.  
 THIS IS HEAT FLOW PROBE LOWERING NINE (HF-9)

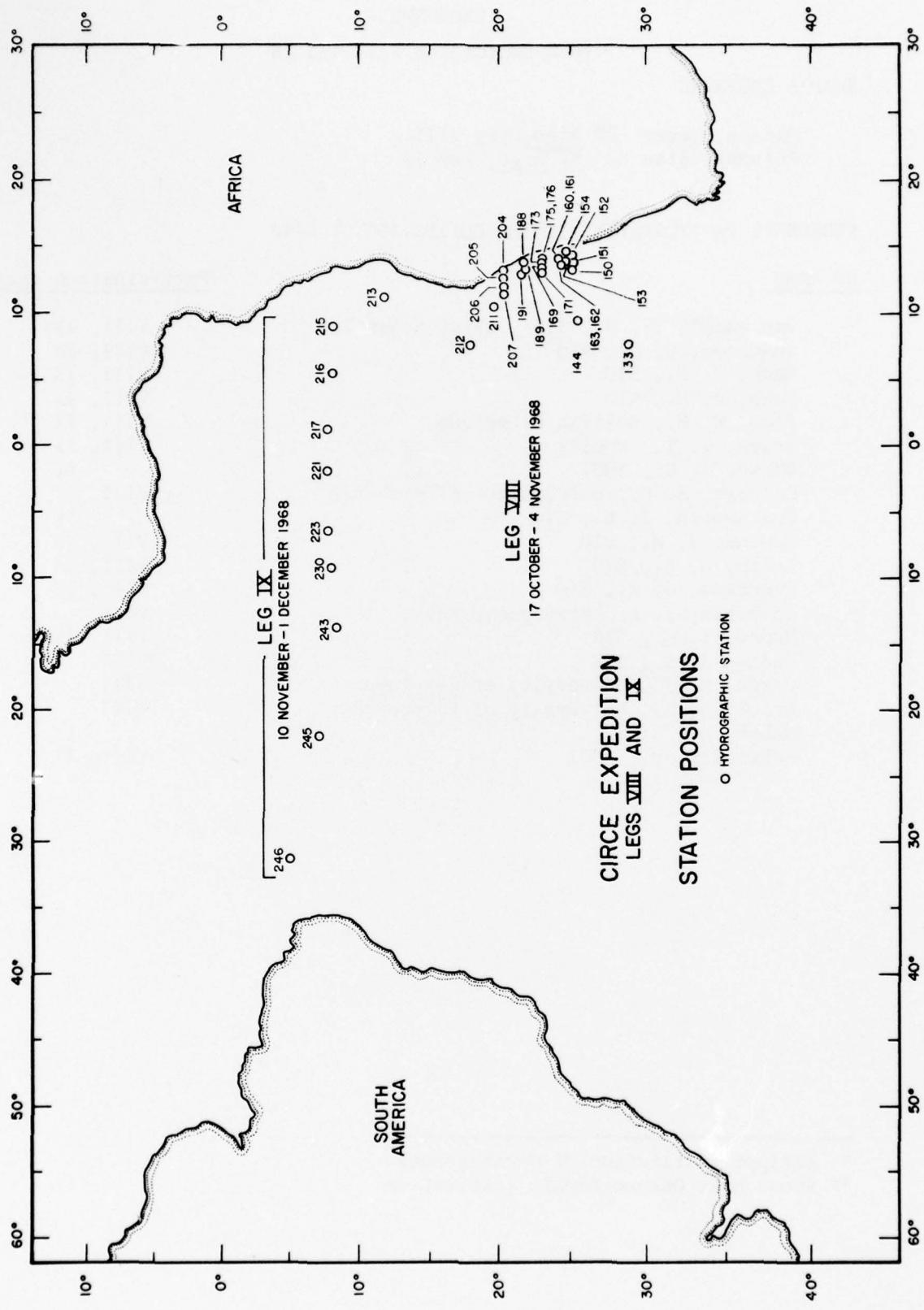


FIGURE 2

## PERSONNEL

## CIRCE Expedition VIII and IX

## SHIP'S CAPTAINS

Hansen, Terry RV Argo, Leg VIII  
 Phinney, Alan W. RV Argo, Leg IX

## PERSONNEL PARTICIPATING IN THE COLLECTION OF DATA

<u>RV ARGO</u>	<u>Participation (Leg)</u>
van Andel, Tj. H., SIO*, Chief Scientist	VIII, IX
Anderson, G. C., SIO	VIII, IX
Bach, J. E., SIO	VIII, IX
Beer, R. M., SIO	VIII, IX
Blow, W. H., British Petroleum	VIII, IX
Bowen, V. T., WHOI**	VIII, IX
Burke, J. C., WHOI	IX
Calvert, S. E., University of Edinburgh	VIII
Coatsworth, J. L., SIO	IX
Edmond, J. M., SIO	VIII, IX
Heath, G. R., SIO	VIII, IX
Hohnhaus, G. W., SIO	VIII, IX
de Matos, J. E., Portuguese Navy	VIII
Moore, T. C., SIO	VIII, IX
Mudie, J. D., SIO	VIII
Orren, M. J., University of Capetown	VIII
Price, N. B., University of Edinburgh	VIII
Saban, D., SIO	IX
Schroeder, B., WHOI	VIII, IX

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\* Scripps Institution of Oceanography

\*\* Woods Hole Oceanographic Institution

RV ARGO

## CIRCE EXPEDITION VIII

133

	LATITUDE 28 31.1S	LONGITUDE 7 33.8E	MO/DAY/YR 10/17/68	MESSENGER TIME 1814	BOTTOM 5063M	WIND 200	SPEED 12KT	WEATHER 2	DOMINANT WAVES 230 05			
Z	T	S	02	P04 S103 N02 N03	DT	Z	T	S	02	SIGT	DT	DD
0	17.49	35.64	5.74		210.6	0	17.49	35.64	5.74	25.905	210.6	0
48	17.34	35.65	5.84		206.4	10	17.46	35.63	5.76	25.909	210.2	.021
96	16.57 A	35.55	5.54		196.3	20	17.43	35.63	5.78	25.916	209.6	.042
145	15.63	35.42	5.59		185.2	30	17.40	35.64	5.80	25.925	208.7	.063
193	14.16	35.32	5.10		161.9	50	17.32	35.65	5.83	25.953	206.1	.105
241	13.14	35.16	5.37		153.5	75	16.95	35.60	5.67	26.005	201.1	.156
289	12.35	35.07	5.12		145.2	100	16.51	35.54	5.55	26.063	195.6	.206
338	11.55	35.00	4.96		135.8	125	16.06	35.47	5.58	26.116	190.5	.256
387	10.82	34.92	4.61		129.0	150	15.48	35.41	5.53	26.199	182.7	.303
435	8.98	34.71	4.73		114.8	200	13.99	35.30	5.13	26.436	160.2	.392
580	6.92	34.50	4.74		101.3	250	12.98	35.14	5.34	26.523	151.9	.473
677	5.46	34.39	4.70		91.6	300	12.17	35.05	5.09	26.617	143.0	.550
774	4.48	34.36	4.70		83.1	400	10.59	34.89	4.63	26.785	127.1	.693
871	3.99	34.37	4.54		77.5	500	8.60	34.67	4.73	26.941	112.3	.822
968	3.59	34.40	4.44		71.4	600	6.57	34.47	4.73	27.080	99.1	.937
1210	3.18	34.56	4.23		55.6	700	5.18	34.38	4.70	27.182	89.4	1.040
1453	3.03	34.69	4.46		44.4	800	4.32	34.36	4.66	27.266	81.5	1.133
15028	3.04	34.73	4.54		41.5	1000	3.50	34.42	4.40	27.396	69.2	1.300
1662C	3.07					1200	3.19	34.55	4.23	27.533	56.2	1.442
17438	3.03	34.80	4.79		36.1	1500	3.04	34.73	4.54	27.687	41.6	1.617
19848	2.97	34.85	5.10		31.8	2000	2.97	34.85	5.12	27.792	31.6	1.862
2034C	2.96					2500	2.67	34.87	5.39	27.831	27.9	2.085
22258	2.84	34.87	5.28		29.2	3000	2.45	34.87	5.46	27.851	26.0	2.301
24658	2.71	34.87			28.1	3500	2.31	34.86	5.42	27.857	25.4	2.518
2497C	2.67					4000	1.78	34.81	5.19	27.857	25.5	2.727
27058	2.57	34.87	5.43		27.0	4500	1.17	34.77	4.53	27.868	24.4	2.915
29448	2.48	34.87	5.46		26.2							
2959C	2.46											
31808	2.40	34.87				25.6						
34158	2.33	34.86	5.43			25.8						
36478	2.237	34.86				25.0						
38788	1.979	34.82	5.30			26.1						
41670	1.46	34.79	5.04			24.6						
41810	1.43	34.78	5.11			25.2						
44150	1.190											
4428D	1.18	34.77	4.64			24.3						
46570	1.135	34.76	5.00U			24.8						
46810	1.13	34.74	4.32			26.2						
47840	1.15	34.74				26.4						

A) ALTERNATE VALUE, 16.45 DEGREES.  
 B) CAST IV. X-17-68, 2227 GMT.  
 C) CAST VII. X-18-68, 0110 GMT.  
 D) CAST IX. X-18-68, 1205 GMT.

Z	T	S	O2	PO4	SiO3	NC2	NO3	DT	DOMINANT WAVES							
									BOTTOM	WIND	SPEED	WEATHER	170	05	08	DD
0	17.24	35.535	5.85					212.5	0	17.24	35.535	5.85	25.885	212.5	0	
49	16.12	35.454	5.92					193.3	10	16.98	35.515	5.86	25.933	208.0	.021	
97	15.45	35.407	5.57					182.3	20	16.73	35.497	5.88	25.977	203.7	.042	
103A	15.64 V	35.439V							30	16.50	35.480	5.89	26.018	199.8	.062	
146	13.82	35.238	5.16					161.1	50	16.11	35.453	5.92	26.089	193.1	.101	
194	12.71	35.088	5.20					150.6	75	15.79	35.435	5.76	26.149	187.5	.150	
200A	12.55	35.091						147.3	100	15.36	35.397	5.54	26.217	181.0	.196	
244	11.79	35.033	4.97					137.7	125	14.55	35.314	5.31	26.331	170.1	.241	
292	10.86	34.929	5.06					129.0	150	13.72	35.219	5.16	26.433	160.5	.283	
341	9.87	34.834	4.61					119.6	200	12.55	35.091	5.17	26.571	147.3	.363	
391	8.90	34.702	4.75					114.2	250	11.68	35.021	4.99	26.685	136.5	.437	
396A	9.11 V	34.725V							300	10.70	34.913	4.99	26.782	127.3	.506	
488	7.10	34.536	4.28					101.0	400	8.73	34.683	4.72	26.933	113.0	.633	
586	5.37	34.423	4.01					88.1	500	6.85	34.516	4.25	27.079	99.2	.747	
588A	5.60 V	34.435							600	5.25	34.424	3.92	27.211	86.7	.847	
604	4.81	34.447	3.49					80.1	700	4.70	34.443	3.51	27.290	79.2	.938	
779A	4.34	34.454						74.6	800	4.29	34.459	3.63	27.348	73.7	1.022	
782	4.34	34.451	3.60					74.9	1000	3.57	34.531	4.01	27.479	61.3	1.173	
880	3.90	34.476	3.79					68.6	1200	3.37	34.650	4.22	27.592	50.6	1.302	
970A	3.62	34.502						64.0	1500	3.29	34.825	4.78	27.740	36.6	1.464	
978	3.59	34.511	3.99					63.0	2000	3.03	34.872	5.16	27.802	30.7	1.697	
1159A	3.40	34.619						53.1	2500	2.79	34.887	5.49	27.836	27.5	1.919	
1218	3.36	34.663	4.24					49.4	3000	2.51	34.892	5.53	27.865	24.8	2.134	
1459	3.315	34.818	4.75					37.3	3500	2.35	34.869	5.45	27.861	25.2	2.349	
1525B	3.27	34.828	4.79					36.2	4000	1.82	34.812	5.19	27.857	25.5	2.562	
1812B	3.08	34.858	5.12					32.2	4500	1.16	34.733		27.841	27.0	2.759	
2023B	3.03	34.874	5.16					30.6								
2274B	2.92	34.884	5.40					28.8								
2569B	2.75	34.890	5.50					26.9								
2811B	2.61	34.912	5.52					24.1								
3051B	2.49	34.886	5.53					25.1								
3292B	2.41	34.882						24.7								
3532B	2.339	34.868	5.44					25.2								
3775B	2.178	34.853						25.1								
3995C	1.83	34.813	5.19					25.5								
4020B	1.770	34.810	5.19					25.3								
4185C	1.48	34.775	5.22U					25.9								
4195C	1.46	34.778	5.09					25.5								
4372C	1.21	34.751	5.21U					25.9								
4382C	1.209	34.749	5.00					26.1								
4669B	1.112	34.711D						28.3								

A) CAST IX. X-24-68, 0553 GMT.

B) CAST III. X-23-68, 2255 GMT. NINE OXYGEN SAMPLES WERE COLLECTED FROM THE TWELVE NANSEN BOTTLES ON THIS CAST, BUT NO RECORD WAS MADE TO INDICATE THE LEVEL FROM WHICH THEY WERE DRAWN. INFORMATION FROM THE CAST SUMMARY SHEET AND THE DESIRED SAMPLE DEPTH SHEET WOULD SUGGEST THE ARRANGEMENT GIVEN.

C) CAST I. X-23-68, 1943 GMT

D) THE LAST SAMPLE BOTTLE OF THIS CAST CONTAINED MUD.

VI BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN DELETED FOR THE INTERPOLATION.

## RV ARGO

## CIRCE EXPEDITION VIII

150

	LATITUDE 25 10.6S	LONGITUDE 13 18.5E	MO/DAY/YR 10/25/68	MESSENGER 223Z	TIME	BOTTOM 1358M	WIND 170	SPEED 20KT	WEATHER	DOMINANT WAVES 160 11 10	DD				
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
1	16.27	35.232	.64	0.0	.11	3.4	212.8	0	16.27	35.232	.882	212.8	0		
49	15.97	35.217	5.85	.55	0.0	.19	4.1	207.3	10	16.21	35.229	25.893	211.8	.021	
96	13.18	35.142	4.60	1.05	1.5	.03	12.8	155.6	20	16.15	35.226	25.905	210.7	.042	
1124	12.93	35.118					152.5	30	16.09	35.223	25.916	209.5	.064		
143	12.25	35.068	4.34	.68	2.0	.01	16.0	143.5	50	15.91	35.215	5.81	25.952	.105	
190	11.38	34.991	3.86	.91	5.9	.01	17.0	133.5	75	14.39	35.169	5.04	26.253	.154	
2024	11.09	34.956					131.0	100	13.10	35.136	4.56	26.496	154.5	.196	
239	10.30	34.877	3.50	2.18	7.8	.02	22.1	123.4	125	12.66	35.097	4.39	26.555	148.9	
286	9.58	34.810	2.79	2.39	10.5	.01	27.5	116.7	150	12.13	35.060	4.27	26.630	.272	
287A	9.79	V 34.838V						200	11.14	34.962	3.80	26.739	131.4	.342	
334	8.66	34.711	2.97	2.86	11.4	.00	29.0	109.9	250	10.13	34.861	3.31	26.842	.408	
380A	7.98	34.652						104.4	300	9.31	34.780	2.84	26.916	.470	
383	7.84	34.633	2.97	3.10	12.4	.02	31.7	103.8	400	7.52	34.606	2.85	27.055	.585	
474A	6.61	34.582					91.1	500	6.30	34.541	2.31	27.172	90.3	.688	
477	6.51	34.556	2.30	2.92	18.6	.01	37.1	91.8	600	5.49	34.496	2.67	27.239	.782	
573A	5.89	V 34.540						700	4.79	34.467	3.01	27.298	78.4	.871	
574B	5.74	34.514					85.6	800	4.37	34.470	3.45	27.347	73.8	.955	
577	5.65	34.546U	2.58	2.76	23.0	.01	39.2		1000	3.76	34.525	3.86	27.454	63.6	
6498	5.16	34.482	2.84	2.56	25.9	.00	36.9	81.3	1200	3.42	34.670	3.85	27.604	49.5	
6668	5.08	34.483					80.3							1.240	
674	4.99	34.478	2.87	2.72	24.8	.01	37.8	79.7							
676A	5.14	V 34.488													
7608	4.52	34.464	3.38	2.68	29.5	.00	37.2	75.7							
7808	4.43	34.469													
8578	4.22	34.472	3.50	2.83	30.4	.00	36.0	72.1							
9058	4.04	34.488													
10478	3.66	34.548	3.96	2.57	36.9	.00	33.2	60.9							
11938	3.43	34.656	3.89					50.6							

## RV ARGO

## CIRCE EXPEDITION VIII

151

	LATITUDE 25 10.0S	LONGITUDE 14 03.2E	MO/DAY/YR 10/26/68	MESSENGER 0742	TIME	BOTTOM 187M	WIND 180	SPEED 16KT	WEATHER 0	DOMINANT WAVES 010 06 08	DD				
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
1	13.16	34.926	6.48	.46	0.0	.24	7.1	171.0	0	13.16	34.926	6.48	26.322	171.0	0
30	13.10	34.936						169.1	10	13.14	34.931	6.47	26.330	170.2	.017
35	13.07	34.930	6.44	.49	0.0	.28	7.2	169.0	20	13.12	34.935	6.46	26.337	169.6	.034
70	11.92	34.955						145.7	30	13.10	34.936	6.45	26.342	169.1	.051
75	11.66	34.946	4.62	1.42	8.8	.25	18.6	141.7	50	12.75	34.943	5.87	26.417	161.9	.084
115	11.25	34.994	2.82	1.93	10.5	.02	24.1	131.0	75	11.66	34.946	4.62	26.630	141.7	.123
125	11.09	34.980						129.2	100	11.40	34.976	3.44	26.701	135.0	.158
149	10.81	34.956						126.2	125	11.09	34.980	2.51	26.762	129.2	.192
153	10.80	34.949	1.92	2.35	20.3	.03	24.4	126.5	150	10.81	34.954	1.96	26.794	126.2	.224
176	10.75	34.946						125.9							
180	10.75	34.949	1.77	2.08	23.4	.06	25.5	125.7							

## RV ARGO

## CIRCE EXPEDITION VIII

152

	LATITUDE 25 09.9S	LONGITUDE 14 15.2E	MO/DAY/YR 10/26/68	MESSENGER 0924	TIME	BOTTOM 170M	WIND 180	SPEED 18KT	WEATHER 0	DOMINANT WAVES 010 06 09	DD					
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD	
1	13.27	34.967	6.18	.72	0.0	.38	7.3	170.1	0	13.27	34.967	6.18	26.331	170.1	0	
31	13.07	34.963						166.6	10	13.18	34.959	6.18	26.342	169.1	.017	
37	13.06	34.955	6.19	.64	1.1	.40	8.3	167.0	20	13.11	34.957	6.19	26.355	167.9	.034	
70	11.55	34.954						139.2	30	13.07	34.962	6.19	26.367	166.7	.051	
80	11.37	34.943	4.47	1.30	8.2	.04	19.2	136.8	50	12.53	34.951	5.77	26.467	157.2	.083	
114	10.95	34.949	3.06	1.75	17.7	.02	24.0	129.1	75	11.45	34.948	4.72	26.672	137.8	.121	
125	10.89	34.945						128.3	100	11.08	34.944	3.63	26.736	131.7	.155	
152	10.56	34.920						124.6	125	10.89	34.945	2.67	26.772	128.3	.188	
165	10.56	34.921	1.49			36.6	.18	27.7	124.5	150	10.58	34.921	1.88	26.809	124.8	.220

A) CAST IV. X-26-68, 0134 GMT.

B) CAST II. X-26-68, 0002 GMT.

VI) BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN DELETED FOR THE INTERPOLATION.

## RV ARGO

## CIRCE EXPEDITION VIII

153

	LATITUDE 25 09.5S	LONGITUDE 14 26.8E	MO/DAY/YR 10/26/68	MESSENGER 1055	TIME	BOTTOM 131M	WIND 180	SPEED 17KT	WEATHER 0	DOMINANT WAVES 010 06 08	DD				
Z	T	S	02	P04	S103	N02	N03	DT	Z	T	S	02	SIGT	DT	DD
1	12.34	34.951	5.95	1.44	1.7	.62	11.3	153.7	0	12.34	34.951	5.95	26.504	153.7	0
28	12.05	34.943						149.0	10	12.25	34.945	5.77	26.517	152.5	.015
38	11.93	34.947	5.14	1.53	6.4	.70	15.4	146.1	20	12.14	34.942	5.56	26.536	150.7	.031
57	11.63	34.945						141.3	30	12.03	34.944	5.33	26.559	148.5	.046
68	11.29	34.939	4.36	1.42	7.8	.06	19.1	135.7	50	11.77	34.947	4.88	26.611	143.6	.075
82	11.10	34.921						133.7	75	11.18	34.929	4.00	26.707	134.5	.110
106	10.57	34.905	2.34	1.75	26.8	.06	25.2	125.9	100	10.68	34.905	2.67	26.778	127.7	.143
123	10.59	34.924						124.8	125	10.59	34.921	1.67	26.807	125.0	.176
128	10.59	34.917	1.58	1.74	32.4	.12	26.1	125.3							

## RV ARGO

## CIRCE EXPEDITION VIII

154

	LATITUDE 25 09.4S	LONGITUDE 14 37.6E	MO/DAY/YR 10/26/68	MESSENGER 1221	TIME	BOTTOM 60M	WIND 190	SPEED 23KT	WEATHER 0	DOMINANT WAVES	DD				
Z	T	S	02	P04	S103	N02	N03	DT	Z	T	S	02	SIGT	DT	DD
0	11.25	34.902	4.20	1.49	21.9	.23	22.2	137.7	0	11.25	34.902	4.20	26.673	137.7	0
12	11.01	34.910	4.15	1.72	24.1	.22	21.5	133.0	10	11.04	34.908	4.16	26.716	133.6	.014
37	10.83	34.916						129.5	20	10.95	34.911	3.93	26.735	131.9	.027
43	10.83	34.901	3.35	1.69	26.5	.20	23.7	130.6	30	10.88	34.913	3.67	26.749	130.4	.040
53	10.81	34.898	3.36	1.59	25.7	.16	23.2	130.4	50	10.82	34.898	3.36	26.749	130.5	.066
58	10.80	34.902						130.0	75	10.60	34.909	1.98	26.796	126.1	.099
66	10.64		2.30	1.75	32.2	.20	24.8								
71	10.61	34.910						126.2							
75	10.60	34.909	1.98	1.77	35.8	.21	25.0	126.1							

## RV ARGO

## CIRCE EXPEDITION VIII

160

	LATITUDE 24 13.5S	LONGITUDE 14 15.5E	MO/DAY/YR 10/27/68	MESSENGER 0605	TIME	BOTTOM 112M	WIND 170	SPEED 12KT	WEATHER 0	DOMINANT WAVES 210 08	DD				
Z	T	S	02	P04	S103	N02	N03	DT	Z	T	S	02	SIGT	DT	DD
1	12.45	34.942	6.00	.71	1.2	.31	11.1	156.4	0	12.45	34.942	6.00	26.476	156.4	0
11	12.41	34.941	5.98	.97	1.9	.31	10.9	155.8	10	12.41	34.941	5.98	26.482	155.8	.016
15	12.43	34.940						156.2	20	12.42	34.944	5.95	26.482	155.8	.031
30	12.41	34.951	5.91	1.16	2.4	.30	11.2	155.0	30	12.41	34.951	5.91	26.490	155.0	.047
40	12.20	34.953						151.0	50	11.88	34.965	4.47	26.604	144.3	.077
69	11.30	34.981	2.82	1.41	11.8	.14	19.4	132.8	75	11.19	34.977	2.45	26.741	131.3	.112
78	11.15	34.974						130.7	100	11.01	34.966	1.71	26.767	128.8	.145
93	11.00	34.967	1.71	1.87	32.8	.19	22.6	128.6							
102	11.01	34.966						128.9							
107	11.02	34.966	1.71	1.87	32.1	.19	22.6	129.0							

## RV ARGO

## CIRCE EXPEDITION VIII

161

	LATITUDE 24 13.5S	LONGITUDE 14 05.4E	MO/DAY/YR 10/27/68	MESSENGER 0900	TIME	BOTTOM 297M	WIND 180	SPEED 17KT	WEATHER 0	DOMINANT WAVES 170 07 10	DD				
Z	T	S	02	P04	S103	N02	N03	DT	Z	T	S	02	SIGT	DT	DD
0	13.08	34.927	6.34	.53	0.5	.35	8.5	169.4							
28	12.98	34.936	6.34	.47	2.4	.35	8.8	166.8							
145A	10.61	34.936						124.2							
150A	10.59	34.934	1.43	2.05	21.6	.15	26.7	124.1							

A) CAST II. X-27-68, 0915 GMT.

RV ARGO

## CIRCE EXPEDITION VIII

162

LATITUDE 24 15.1S	LONGITUDE 13 51.5E	MO/DAY/YR 10/27/68	MESSENDER TIME 1100	BOTTOM 255M	WIND 180	SPEED 17KT	WEATHER 0	DOMINANT WAVES 170 07 10							
Z	T	S	O2	PO4	SIO3	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	14.21	34.974	6.21	1.13	1.2	.37	7.8	188.2	0	14.21	34.974	6.21	26.141	188.2	0
37	13.92	34.981	6.13	1.49	2.7	.27	7.5	181.9	10	14.13	34.976	6.19	26.159	186.5	.019
58	13.18	35.034						163.5	20	14.05	34.978	6.17	26.177	184.8	.037
77	12.43	35.023	4.45	1.33	7.7	.26	17.0	150.1	30	13.97	34.979	6.15	26.195	183.1	.056
105	11.86	35.043						138.2	50	13.49	35.015	5.61	26.323	170.9	.091
115	11.78	35.035	3.98	1.46	11.3	.01	20.3	137.3	75	12.50	35.025	4.54	26.529	151.3	.132
142	11.32	35.000						131.7	100	11.92	35.040	4.10	26.654	139.5	.169
161	11.05	34.962	3.46	1.76	9.4	.01	20.1	129.8	125	11.63	35.024	3.86	26.698	135.3	.204
180	10.73	34.932						126.6	150	11.21	34.984	3.57	26.744	130.9	.238
199	10.36	34.894	3.15	1.95	12.5	.01	23.0	123.2	200	10.34	34.892	3.13	26.828	123.0	.304
209	10.19	34.884						121.1	250	9.62	34.846	2.02	26.915	114.7	.366
228	9.76	34.841	2.39	1.97	15.6	.00	27.0	117.3							
248	9.63	34.848						114.7							
252	9.62	34.844	1.99	2.60	20.2	.03	29.9	114.8							

RV ARGO

## CIRCE EXPEDITION VIII

163

LATITUDE 24 14.2S	LONGITUDE 13 41.6E	MO/DAY/YR 10/28/68	MESSENDER TIME 1307	BOTTOM 294M	WIND 170	SPEED 21KT	WEATHER 0	DOMINANT WAVES 170 08 10							
Z	T	S	O2	PO4	SIO3	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	14.47	34.975	6.21	1.23	1.3	.21	7.0	193.4	0	14.47	34.975	6.21	26.086	193.4	0
39	14.25	34.971	6.26	.64	1.6	.22	6.3	189.2	10	14.40	34.973	6.22	26.100	192.1	.019
58	14.21	34.974						188.2	20	14.33	34.971	6.24	26.112	190.9	.038
77	13.77	35.088	5.32	1.05	4.3	.20	11.2	171.1	30	14.28	34.971	6.25	26.122	189.9	.058
106	12.84	35.114						151.1	50	14.23	34.973	6.05	26.136	188.6	.096
115	12.61	35.102	4.24	1.16	6.7	.01	15.7	147.7	75	13.83	35.075	5.38	26.299	173.2	.141
144	12.03	35.076						138.8	100	13.03	35.120	4.63	26.497	154.4	.183
163	11.58	35.018	3.95	1.38	8.1	.02	17.9	135.0	125	12.40	35.096	4.17	26.604	144.2	.221
181	11.31	35.001						131.5	150	11.88	35.057	4.02	26.675	137.5	.257
201	11.05	34.974	3.02	2.05	12.7	.02	20.6	129.0	200	11.07	34.975	3.04	26.763	129.1	.326
210	10.81	34.962						125.7	250	10.03	34.875	2.32	26.869	119.1	.391
229	10.35	34.900	2.73	1.97	14.4	.01	25.7	122.6							
249	10.05	34.878						119.2							
268	9.73	34.847	2.02	2.42	18.9	.00	27.8	116.4							
274	9.69	34.843						116.0							
278	9.68	34.844	1.96	2.44	19.5	.01	29.1	115.8							

RV ARGO

## CIRCE EXPEDITION VIII

171

LATITUDE 23 02.6S	LONGITUDE 13 07.1E	MO/DAY/YR 10/28/68	MESSENDER TIME 1338	BOTTOM 340M	WIND 170	SPEED 23KT	WEATHER 2	DOMINANT WAVES 160 12 13							
Z	T	S	O2	PO4	SIO3	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	14.94	35.089	5.79	.50	0.0	.25	8.3	194.8	0	14.94	35.089	5.79	26.072	194.8	0
28	14.94	35.077	5.80	.48	0.0	.25	8.5	195.6	10	14.94	35.085	5.79	26.068	195.1	.020
56	14.74	35.290	5.16	.77	0.0	.25	9.2	175.9	20	14.94	35.080	5.80	26.065	195.4	.039
74	14.06	35.240	4.79	.75	0.0	.06	10.9	165.7	30	14.93	35.088	5.76	26.075	194.5	.059
79	13.92	35.225						164.0	50	14.78	35.235	5.32	26.219	180.8	.096
97	13.62	35.200	4.52	.85	0.0	.04	12.5	159.9	75	14.03	35.237	4.78	26.382	165.3	.140
138	12.76	35.145	3.73	1.19	1.7	.03	16.7	147.3	100	13.57	35.196	4.47	26.446	159.2	.181
148	12.46	35.132						142.6	125	13.08	35.162	4.01	26.521	152.1	.221
185	11.98	35.091	2.56	1.56	4.9	.02	23.1	136.8	150	12.43	35.131	3.40	26.625	142.2	.259
190	11.84	35.079						135.2	200	11.63	35.055	2.51	26.722	133.1	.330
232	11.06	34.988	2.39	1.91	5.9	.00	25.9	128.1	250	10.70	34.953	2.27	26.813	124.4	.397
237	10.96	34.979						127.0	300	9.91	34.872	1.80	26.888	117.3	.460
276	10.23	34.906	2.06	9.8	.03	29.0	120.1								
319	9.75	34.856						116.0							
324	9.73	34.854	1.49	2.24	14.0	.07	31.0	115.8							

RV ARGO

## CIRCE EXPEDITION VIII

173

LATITUDE 22 59.5S	LONGITUDE 13 41.0E	MO/DAY/YR 10/28/68	MESSENDER TIME 1707	BOTTOM 153M	WIND 190	SPEED 15KT	WEATHER 1	DOMINANT WAVES 180 10							
Z	T	S	O2	PO4	SIO3	NC2	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	13.63	35.03	5.69	1.16	0.0	.20	10.4	172.5	0	13.63	35.03	5.69	26.306	172.5	0
24	13.60	35.02	5.63	1.21	0.0	.21	10.4	172.7	10	13.62	35.03	5.66	26.305	172.6	.017
38	13.58	35.04	5.63	.76	0.0	.23	10.0	170.8	20	13.61	35.02	5.63	26.305	172.7	.035
57	13.02	35.08	4.40	1.39	1.8	.18	15.8	157.0	30	13.59	35.03	5.63	26.313	171.9	.052
66	12.57	35.09						147.8	50	13.29	35.07	4.93	26.403	163.3	.086
84	12.02	35.08	2.92	1.78	8.8	.09	20.6	138.4	75	12.24	35.09	3.37	26.635	141.3	.124
89	11.95	35.06						138.6	100	11.77	35.06	2.27	26.696	135.6	.159
107	11.67	35.06	2.06	2.52	14.8	.13	24.1	133.5	125	11.60	35.04	1.78	26.714	133.8	.194
116	11.61	35.04						133.9							
132	11.60	35.04	1.75	2.27	14.9	.17	24.6	133.7							
137	11.60	35.04						133.7							
140	11.60	35.04	1.74	3.14	10.7	.15	24.4	133.7							

## RV ARGO

## CIRCE EXPEDITION VII

175

	LATITUDE 22 56.4S	LONGITUDE 13 59.6E	MO/DAY/YR 10/28/68	MESSINGER TIME 1936	BOTTOM 134M	WIND 190	SPEED 16KT	WEATHER	DOMINANT WAVES						
Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	Z	T	S	O2	SIGT	DT	DD
0	12.97	35.021	5.03	1.36	12.7	.32	18.6	160.4	0	12.97	35.021	5.03	26.434	160.4	0
29	12.41	35.064	3.53	1.61	7.9	.14	19.4	146.7	10	12.72	35.036	4.41	26.495	154.6	.016
39	12.33	35.078		1.71	5.6	.14	19.7	144.2	20	12.53	35.051	3.89	26.544	149.9	.031
43	12.19	35.084						141.2	30	12.40	35.063	3.51	26.579	146.6	.046
53	12.04	35.072	3.01	1.81	6.5	.12	21.3	139.3	50	12.07	35.072	3.07	26.650	139.9	.075
67	11.82	35.062						136.1	75	11.61	35.039	2.18	26.713	133.9	.109
76	11.58	35.036	2.14	1.90	13.1	.20	25.0	133.7	100	11.36	35.033	1.01	26.754	130.0	.143
90	11.44	35.037						131.1							
100	11.36	35.033	1.01	2.27	22.0	.16	25.7	130.0							
117	11.23	35.017						128.9							
120	11.23	35.015	.96	2.67	29.0	.36	26.7	129.1							
122	11.22	35.022	.97	2.64	30.0	.35	25.0	128.4							

## RV ARGO

## CIRCE EXPEDITION VIII

176

	LATITUDE 22 57.0S	LONGITUDE 14 13.9E	MO/DAY/YR 10/28/68	MESSINGER TIME 2352	BOTTOM 127M	WIND 160	SPEED 18KT	WEATHER	DOMINANT WAVES						
Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	Z	T	S	O2	SIGT	DT	DD
0	12.75	35.029	6.77	1.39	11.8	.09	19.9	155.7	0	12.75	35.029	6.77	26.484	155.7	0
24	12.32	35.11 A	3.41	1.54	4.4	.21	18.8	141.7	10	12.59	35.089	4.15	26.562	148.2	.015
33	12.12	35.085						139.8	20	12.40	35.111	3.61	26.616	143.1	.030
44	11.99	35.072	2.61	1.65	7.1	.15	19.4	138.4	30	12.18	35.094	3.13	26.645	140.3	.044
58	11.83	35.071						135.6	50	11.93	35.072	2.51	26.678	137.3	.072
68	11.67	35.057	2.19	1.90	6.0	.16	20.6	133.7	75	11.51	35.042	1.82	26.734	131.9	.106
86	11.29	35.024						129.4	100	11.25	35.025	.62	26.768	128.7	.139
100	11.25	35.025	.62	2.38	23.6	.30	22.0	128.7							
110	11.25	35.021						129.0							
114	11.25	35.045	.49	2.31	26.8	.04	20.1	127.2							

## RV ARGO

## CIRCE EXPEDITION VIII

188

	LATITUDE 21 51.5S	LONGITUDE 13 46.8E	MO/DAY/YR 10/29/68	MESSINGER TIME 1022	BOTTOM 93M	WIND 150	SPEED 13KT	WEATHER	DOMINANT WAVES 180 04 10						
Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	Z	T	S	O2	SIGT	DT	DD
0	13.75	35.084	6.75	.18	0.0	.01	0.0	171.0	0	13.75	35.084	6.75	26.323	171.0	0
10	13.65	35.069	6.27	.32	0.0	.03	0.9	170.1	10	13.65	35.069	6.27	26.332	170.1	.017
29	12.40	35.103						143.7	20	12.99	35.082	4.28	26.477	156.3	.033
34	12.31	35.107	1.46	1.97	18.5	.10	24.6	141.7	30	12.38	35.104	2.27	26.615	143.2	.048
53	11.96	35.101	1.16	2.01	19.6	.39	21.8	135.7	50	12.00	35.102	1.21	26.687	136.4	.077
63	11.93	35.105						134.9	75	11.81	35.096	.02	26.718	133.4	.111
73	11.82	35.099	.02	2.53	46.0	2.23	8.5	133.3							
88	11.77	35.081						133.8							
93	11.78	35.084	.01	2.97	45.2	3.24	7.4	133.7							

## RV ARGO

## CIRCE EXPEDITION VIII

189

	LATITUDE 21 52.4S	LONGITUDE 13 36.0E	MO/DAY/YR 10/30/68	MESSINGER TIME 0020	BOTTOM 132M	WIND 170	SPEED 13KT	WEATHER	DOMINANT WAVES 050 04 11						
Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	Z	T	S	O2	SIGT	DT	DD
0	14.11	35.077	7.04	.02	0.0	.04	0.0	178.6	0	14.11	35.077	7.04	26.241	178.6	0
26	13.74	35.089	6.11	.44	0.0	.08	3.1	170.4	10	14.04	35.104	6.85	26.277	175.2	.018
31	13.60	35.070						169.0	20	13.88	35.103	6.45	26.310	172.1	.035
36	13.51	35.075	5.38	.42	0.0	.10	7.7	166.9	30	13.63	35.073	5.82	26.340	169.3	.052
55	13.23	35.064	4.52	.99	2.2	.18	13.6	162.3	50	13.31	35.065	4.73	26.397	163.8	.086
65	12.95		3.89	1.14	5.7	.19	19.4		75	12.36	35.078	2.14	26.598	144.8	.125
69	12.61	35.065						150.4	100	11.65	35.070	.67	26.728	132.5	.160
74	12.40	35.074	2.28	1.17	6.2	.20	22.6	145.8							
84	12.03	35.098	1.20	2.14	18.5	.13	25.2	137.2							
89	11.84	35.084						134.8							
103	11.64	35.069	.57	2.03	25.0	.02	26.2	132.3							
111	11.61	35.066	.58	2.29	37.3	.06	26.2	132.0							
116	11.61	35.069						131.8							
121	11.61	35.067	.60	2.31	37.9	.11	25.7	131.9							

A) THIS SAMPLE BOTTLE WAS BROKEN AT THE TOP. THE VALUE HAS BEEN ACCEPTED ALTHOUGH EVAPORATION WAS POSSIBLE.

**RV ARGO** CIRCE EXPEDITION VIII **191**

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES							
21 53.3S	13 11.8E	10/30/68	0330	173M	100	14Kt		140 06 10							
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	14.73	35.094	5.73	.47	0.0	.13	6.2	190.0	0	14.73	35.094	5.73	26.122	190.0	0
27	14.16	35.147	4.99	.82	1.6	.17	10.6	174.5	10	14.61	35.104	5.44	26.154	186.9	.019
37	13.74	35.189							20	14.39	35.125	5.17	26.220	180.7	.037
56	13.55	35.187	4.32	1.07	3.1	.14	14.4	159.5	30	14.03	35.160	4.92	26.323	170.9	.055
66	13.29	35.195							50	13.59	35.182	4.46	26.432	160.6	.088
85	12.88	35.153	3.58	1.13	4.6	.05	17.6	149.0	75	13.08	35.177	3.84	26.532	151.1	.128
104	12.63	35.155	3.11	1.29	4.8	.08	18.1	144.1	100	12.68	35.154	3.21	26.594	145.2	.165
127	12.19	35.123							125	12.23	35.127	2.69	26.662	138.8	.202
145	11.84	35.074	2.27	1.93	8.6	.07	23.2	135.5	150	11.77	35.073	2.14	26.708	134.3	.237
155	11.72	35.073													
158	11.71	35.071	1.93	1.79	11.2	.08	24.0	133.4							

**RV ARGO** CIRCE EXPEDITION VIII **204**

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES							
20 19.9S	13 01.8E	10/31/68	0233	117M	160	17Kt		160 04							
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	13.81	35.112	5.38	1.02	3.3	.41	11.6	170.1	0	13.81	35.112	5.38	26.332	170.1	0
10	13.75	35.115	5.35	.96	3.5	.47	11.8	168.7	10	13.75	35.115	5.35	26.346	168.7	.017
29	13.54	35.109	4.85	1.23	7.2	.47	13.8	165.0	20	13.64	35.112	5.09	26.367	166.7	.034
34	13.22	35.114							30	13.48	35.110	4.73	26.400	163.6	.050
39	13.02	35.111	3.71	1.54	13.0	.56	19.4	154.8	50	12.96	35.106	3.58	26.502	153.9	.082
58	12.91	35.104	3.49	2.01	13.2	.53	19.5	153.2	75	12.77	35.109	3.15	26.542	150.2	.121
66	12.85	35.103							100	12.13	35.117	1.53	26.673	137.7	.157
77	12.74	35.111	3.08	1.06	14.8	1.06	21.4	149.4							
100	12.13	35.117													
104	12.13	35.119	1.14	2.46	21.0	2.46	26.3	137.5							

**RV ARGO** CIRCE EXPEDITION VIII **205**

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES							
20 22.2S	12 51.4E	10/31/68	0405	138M	150	14Kt		160 04							
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	13.74	35.12	5.37	1.06	5.5	.40	13.0	168.1	0	13.74	35.12	5.37	26.352	168.1	0
29	13.67	35.12	5.18	1.17	4.7	.43	12.1	166.7	10	13.72	35.12	5.34	26.357	167.6	.017
43	13.57	35.117	4.96	1.40	5.8	.42	14.6	165.0	20	13.69	35.12	5.28	26.362	167.2	.034
58	13.54	35.22 U	4.92	1.17	7.1	.42	14.6		30	13.66	35.12	5.16	26.368	166.6	.050
62	13.54	35.119							50	13.56	35.12	4.93	26.389	164.7	.084
77	13.48	35.123	4.74	1.14	6.9	.41	14.6	162.8	75	13.49	35.12	4.76	26.405	163.1	.125
82	13.47	35.14							100	12.98	35.16	3.00	26.538	150.5	.165
105	12.77	35.156	2.55	1.73	9.1	.20	21.6	146.7	125	12.18	35.13	1.42	26.672	137.8	.202
112	12.51	35.151													
123	12.18	35.13													
127	12.18	35.12	1.33	2.12	16.1	.33	26.6	138.4							

**RV ARGO** CIRCE EXPEDITION VIII **206**

LATITUDE	LONGITUDE	MO/DAY/YR	MESSENDER TIME	BOTTOM	WIND	SPEED	WEATHER	DOMINANT WAVES							
20 24.0S	12 39.1E	10/31/68	0547	198M	160	20Kt		160 04							
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	14.98	35.117	6.11	.94	0.0	.14	3.7	193.5	0	14.98	35.117	6.11	26.085	193.5	0
29	14.90	35.191	5.71	.86	0.0	.16	6.3	186.5	10	14.95	35.134	6.03	26.104	191.7	.019
58	14.44	35.232	4.76	1.17	0.9	.21	12.7	174.0	20	14.92	35.160	5.89	26.130	189.2	.038
68	14.21	35.257							30	14.89	35.192	5.68	26.162	186.2	.057
87	13.50	35.218	3.55	1.41	4.2	.01	18.9	156.2	50	14.60	35.220	5.06	26.246	178.2	.094
111	12.59	35.169							75	13.97	35.249	4.10	26.404	163.2	.137
116	12.51	35.161	1.73	1.91	12.1	.00	22.6	141.4	100	12.95	35.190	2.81	26.567	147.7	.176
140	12.24	35.139							125	12.39	35.149		26.649	140.0	.213

RV ARGO

## CIRCE EXPEDITION VIII

207

	LATITUDE 20 24.8S	LONGITUDE 12 28.0E	MO/DAY/YR 10/31/68	MESSENDER 0725	TIME	BOTTOM 268M	WIND 160	SPEED 20KT	WEATHER 1	DOMINANT WAVES 150 04 10					
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	15.09	35.181	6.21	.81	0.0	.22	4.6	191.2	0	15.09	35.181	6.21	26.110	191.2	0
39	14.95	35.191	5.79	.90	0.0	.25	5.6	187.5	10	15.05	35.183	6.10	26.119	190.2	.019
58	14.48	35.254						173.2	20	15.02	35.186	5.99	26.129	189.3	.038
77	13.95	35.243	3.94	1.57	4.8	.07	17.4	163.3	30	14.98	35.188	5.89	26.139	188.4	.057
106	13.34	35.215						153.3	50	14.70	35.229	5.29	26.233	179.5	.094
116	13.24	35.207	2.81	1.74	7.9	.08	23.3	152.0	75	14.00	35.246	4.05	26.394	164.2	.137
144	12.90	35.197						146.2	100	13.44	35.221	3.21	26.493	154.7	.178
163	12.58	35.25 U	1.76	1.98	12.7	.03	27.4		125	13.14	35.204	2.58	26.540	150.3	.217
182	12.14	35.126						137.2	150	12.81	35.195	2.01	26.601	144.6	.255
211	11.91	35.102						134.7	200	11.98	35.107	1.43	26.695	135.6	.327
230	11.63	35.076	1.14	2.15	17.2	.02	27.4	131.6	250	11.39	35.050	.79	26.762	129.3	.396
239	11.41	35.050	.96	2.21	23.5	.09	29.7	129.6							
250	11.39	35.050						129.3							
255	11.39	35.068	.73	2.47	24.6	.11	28.4	128.0							

RV ARGO

## CIRCE EXPEDITION VIII

211

	LATITUDE 19 58.1S	LONGITUDE 10 42.3E	MO/DAY/YR 10/31/68	MESSENDER 2310	TIME	BOTTOM 1390M	WIND 160	SPEED 16KT	WEATHER	DOMINANT WAVES					
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	16.15	35.279	5.77	1.04	0.0	.27	9.6	206.8	0	16.15	35.279	5.77	25.946	206.8	0
49	15.58	35.315	5.43	1.08	0.0	.55	19.4	191.8	10	16.03	35.265	5.70	25.961	205.2	.021
96	13.94	35.291	3.94	1.75	7.2	.05	23.0	159.6	20	15.92	35.262	5.63	25.986	202.9	.041
146	13.35	35.269	2.52	1.83	9.0	.03	26.5	149.5	30	15.80	35.269	5.56	26.018	199.8	.061
195	12.25	35.158	1.28	1.79	9.3	.04	30.0	136.8	50	15.55	35.314	5.40	26.111	191.1	.101
217A	11.56	35.077						130.3	75	14.67	35.302	4.67	26.294	173.7	.147
244	11.09	35.036	1.09	1.99	12.3	.02	32.2	125.1	100	13.88	35.291	3.82	26.455	158.4	.189
293	10.52	34.972	.93	2.13	14.3	.00	38.5	120.1	125	13.56	35.285	3.10	26.518	152.4	.228
343	9.53	34.864	.88	2.19	14.9	.00	39.2	111.9	150	13.28	35.263	2.40	26.558	148.6	.267
392	8.91	34.806	1.03	2.21	16.5	.00	40.8	106.6	200	12.09	35.138	1.26	26.698	135.3	.340
488	7.46	34.686	1.52	2.46	19.4	.00	39.6	94.6	250	11.02	35.029	1.07	26.813	124.4	.408
591	6.19	34.585	1.95	2.55	23.9	.00	42.8	85.7	300	10.38	34.956	.92	26.871	118.9	.472
658A	5.55	34.514						83.3	400	8.79	34.795	1.07	27.011	105.6	.592
689	5.34	34.527	2.44	2.41	28.9	.00	41.5	79.9	500	7.30	34.674	1.57	27.141	93.3	.699
789	4.73	34.502	2.81	2.48	32.0	.00	41.7	75.1	600	6.09	34.573	2.00	27.224	85.5	.797
879A	4.33	34.504						70.8	700	5.27	34.526	2.48	27.290	79.2	.887
887	4.31	34.506	3.14	2.68	35.4	.00	38.0	70.4	800	4.67	34.501	2.85	27.339	74.6	.973
986	3.97	34.549	3.49	2.35	39.0	.00	39.4	63.8	1000	3.94	34.555	3.52	27.460	63.1	1.128
1085A	3.80	34.601						58.2	1200	3.66	34.702	3.94	27.605	49.3	1.260
1179	3.69	34.693	3.88	1.95	39.5	.00	35.4	50.2							
1324	3.54	34.774	4.33	1.88	38.3	.00	31.4	42.7							
1358	3.52	34.817	5.27U	1.88	38.7	.00	33.3	39.3							

A) CAST IV. XI-01-68, 0111 GMT.

	LATITUDE 18 11.95	LONGITUDE 7 35.7E	MO/DAY/YR 11/02/68	MESSINGER 0601	TIME	BOTTOM 5140M	WIND 140	SPEED 13KT	WEATHER 1	DOMINANT WAVES					
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
1	17.93	35.619	5.64			222.4	0	17.93	35.619	5.64	25.781	222.4	0		
44A	17.89	35.622	5.67			221.2	10	17.92	35.619	5.65	25.784	222.1	.022		
77	16.31	35.511	5.36			193.4	20	17.91	35.620	5.65	25.786	221.9	.044		
100	14.21	35.332	4.36			162.0	30	17.90	35.621	5.66	25.789	221.6	.067		
133	13.13	35.237	3.64			147.6	50	17.72	35.613	5.61	25.829	217.8	.111		
165	12.44	35.165	3.44			139.9	75	16.45	35.521	5.38	26.062	195.7	.163		
198	11.72	35.109	3.24			130.8	100	14.21	35.332	4.36	26.417	162.0	.209		
2268	11.06						125	13.27	35.253	3.75	26.552	149.2	.248		
230	11.13	35.047	2.94			125.0	150	12.74	35.197	3.50	26.615	143.2	.286		
264	10.41	35.044U	2.96				200	11.64	35.095	3.22	26.750	130.4	.356		
329	9.24 C	34.816	3.31			110.9	250	10.84	35.023	2.95	26.840	121.8	.422		
395	8.39	34.756	1.78			102.6	300	9.72	34.869	3.15	26.916	114.6	.484		
4258	7.17 V						400	8.31	34.750	1.79	27.051	101.9	.599		
461	7.26	34.663	1.93			93.6	500	6.62	34.597	2.42	27.174	90.2	.703		
526	6.21	34.554	2.78			88.2	600	5.20	34.480	3.22	27.261	82.0	.796		
593	4.98 U	34.456	3.19				700	4.54	34.472	3.52	27.330	75.4	.882		
6228	4.96						800	4.21	34.487	3.70	27.378	70.8	.962		
660	4.63	34.457	3.44			77.4	1000	3.74	34.562	3.88	27.487	60.5	1.110		
8208	4.13						1200	3.60	34.691	4.22	27.602	49.6	1.239		
826	4.07	34.482	2.98U			69.8	1500	3.47	34.845	4.72	27.739	36.7	1.402		
9198	3.91						2000	3.19	34.927	5.15	27.832	27.9	1.632		
995	3.74	34.559	3.87			60.8	2500	2.79	34.919	5.24	27.862	25.0	1.843		
11188	3.67						3000	2.52	34.912	5.33	27.880	23.3	2.049		
12158	3.59						3500	2.41	34.916	5.31	27.893	22.1	2.254		
14128	3.52						4000	2.37	34.896	5.39	27.880	23.4	2.469		
15900	3.44	34.882	4.86			33.7	4500	2.40	34.893	5.37	27.875	23.8	2.700		
16068	3.44						5000	2.45	34.889	5.46	27.868	24.5	2.947		
18450	3.30	34.914	5.13			30.0									
20820	3.12	34.931	4.94U			27.1									
22290	3.00	34.925	5.18			26.5									
25760	2.74	34.920	5.26			24.6									
26180	2.72	34.913				25.0									
28220	2.60	34.904	5.32			24.6									
30690	2.50	34.918	5.33			22.7									
3315D	2.43	34.920	5.38			22.0									
35610	2.39E	34.916	5.29			22.1									
3611D	2.377	34.895	5.38			23.5									
38080	2.37	34.901	5.40			23.0									
38580	2.378	34.894				23.6									
3908E	2.37	34.898	5.38			23.2									
4054D	2.378	34.895	5.40			23.5									
4102E	2.374	34.897				23.3									
4150E	2.38	34.893	5.36			23.7									
4397E	2.399	34.904	5.36			23.0									
4406E	2.40	34.895				23.7									
4595E	2.41	34.893	5.02U			23.9									
4643E	2.42	34.890				24.2									
4775E	2.449	34.891				24.4									
4890E	2.44	34.894	5.43			24.1									
4965E	2.449	34.890				24.5									
5019E	2.455	34.890	5.46			24.5									

- A) A PRETRIP MAY HAVE STARTED WITH THIS NANSEN BOTTLE SO ALL THE DEPTHS FOR THIS CAST BELOW THIS LEVEL ARE SLIGHTLY UNCERTAIN.  
 B) CAST IX XI-02-68, 1326 GMT.  
 C) MEAN VALUE OF 9.27 AND 9.21 DEGREES.  
 D) CAST VI. XI-02-68, 1052 GMT. TWELVE OXYGEN SAMPLES WERE COLLECTED FROM THE FOURTEEN NANSEN BOTTLES ON THIS CAST, BUT NO RECORD WAS MADE TO INDICATE THE LEVEL FROM WHICH THEY WERE DRAWN. THE VALUES IN THE ORDER DETERMINED ARE 4.86, 5.13, 4.94, 5.18, 5.26, 5.32, 5.33, 5.38, 5.29, 5.38, 5.40, 5.40. COMPARING THE OXYGEN VERSUS DEPTH CURVES FOR STATIONS 211 - 216 WOULD SUGGEST THE ARRANGEMENT GIVEN.  
 E) CAST I. XI-02-68, 0300 GMT.  
 F) BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN DELETED FOR THE INTERPOLATION.

	LATITUDE 11 59.0S	LONGITUDE 11 12.5E	MO/DAY/YR 11/04/68	MESSENGER 1043	TIME	BOTTOM 3518M	WIND 150	SPEED 03KT	WEATHER Z	DOMINANT WAVES 140 05 14	DD				
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
3	23.49	35.865	5.06	.18	3.2	.02	347.5	0	23.49	35.865	5.06	24.466	347.5	0	
52	15.91	35.582	1.52	1.53	8.2	.36	179.4	10	22.03	35.769	4.36	24.814	314.4	.033	
100	14.50	35.464	1.12	1.19	11.2	.03	158.2	20	20.16	35.678	3.47	25.256	272.4	.063	
198	12.93	35.270	1.19	1.94	13.0	.03	141.4	30	18.55	35.625	2.72	25.632	236.6	.088	
201	12.87	35.272		1.95	13.1	.01	140.1	50	16.10	35.584	1.60	26.192	183.4	.130	
247	11.94	35.156	1.08	2.04	14.0	.01	131.3	75	15.23	35.522	1.33	26.340	169.3	.175	
295	11.03	35.051	.92	2.16	16.2	.10	122.9	100	14.50	35.464	1.12	26.456	158.2	.216	
345	10.01	34.938	.65	2.40	18.7	.00	114.2	125	14.05	35.389	1.14	26.495	154.6	.256	
393	9.10	34.858	.62	2.51	20.6	.02	105.7	150	13.64	35.332	1.16	26.538	150.5	.296	
441	8.25	34.760	.58	2.72	23.1	.00	100.2	200	12.89	35.271	1.19	26.643	140.5	.371	
444		34.754			23.1			250	11.88	35.149	1.07	26.746	130.8	.441	
491	7.310	34.672	.94	2.47U	25.4	.03	93.6	300	10.93	35.039	.89	26.838	122.1	.508	
538	6.760	34.637	1.09	2.84	27.3	.05	89.0	400	9.98	34.843	.61	27.020	104.8	.629	
588	6.293	34.602	1.36	2.86	28.7	.00	85.7	500	7.19	34.664	.97	27.148	92.6	.736	
684	5.47	34.542	1.91	2.81	31.7	.03	80.3	600	6.19	34.597	1.43	27.230	84.9	.833	
687	5.440	34.539		2.72U	31.5	.01	80.2	700	5.33	34.536	2.00	27.291	79.1	.923	
780	4.82	34.565	2.44	2.71	33.2	.08	71.3	800	4.73	34.565	2.53	27.383	70.4	1.007	
971	4.228	34.571	3.21	2.64	38.3	.04	64.7	1000	4.19	34.587	3.30	27.459	63.2	1.159	
1206	4.03	34.724	3.85	2.53	36.0	.01	51.2	1200	4.03	34.719	3.84	27.581	51.6	1.294	
1439	3.83	34.861	4.56	2.18	31.7	.00	38.9	1500	3.79	34.904	4.77	27.753	35.3	1.462	
1442	3.832	34.866		1.88	31.5	.00	38.6								

Z	T	S	D2	PO4	S103	N02	N03	DT	Z	T	S	D2	DOMINANT WAVES					
													MESSENDER	TIME	BOTTOM	WIND	SPEED	WEATHER
0	24.61	35.886	4.94	.25				377.7	0	24.61	35.886	4.94	24.149	377.7			0	
45	15.76	35.561	1.94	1.46				177.7	10	22.04	35.710	4.05	24.765	319.1	.035			
101	14.47	35.463	1.80	1.65				157.7	20	19.82	35.613	3.29	25.296	268.6	.064			
202	12.99	35.279						141.9	30	17.94	35.570	2.65	25.742	226.2	.089			
205	12.90	35.271	1.70	1.82				140.7	50	15.64	35.551	1.93	26.270	175.9	.130			
223	12.61	35.237	1.62	1.80				137.7	75	15.07	35.506	1.86	26.364	167.0	.173			
302	10.97	35.036	1.76	1.95				123.0	100	14.49	35.464	1.80	26.458	158.1	.214			
353	10.15	34.952	.80	2.35				115.4	125	14.21	35.430	1.78	26.494	154.7	.254			
404	9.03	34.836	.58	2.59				106.2	150	13.87	35.388	1.75	26.532	151.1	.293			
452	7.91	34.726						97.9	200	13.03	35.283	1.70	26.625	142.3	.369			
455		34.725	.75	2.42U					250	12.06	35.167	1.67	26.726	132.6	.441			
504	7.16	34.663	1.03	2.58				92.3	300	11.01	35.041	1.76	26.824	123.4	.508			
546	6.58	34.610	1.43	2.76				88.7	400	9.12	34.845	.60	26.997	107.0	.631			
603	6.04	34.582	1.77	2.69				84.1	500	7.21	34.668	1.00	27.148	92.6	.739			
703	5.26	34.584U							600	6.06	34.584	1.76	27.236	84.3	.836			
706	5.250	34.524	2.20	2.69				79.2	700	5.28	34.525	2.18	27.288	79.4	.926			
804	4.71	34.516	2.79	2.69				73.8	800	4.73	34.517	2.77	27.344	74.1	1.011			
1003	4.23	34.591	3.36	2.33				63.2	1000	4.23	34.590	3.35	27.457	63.4	1.167			
1202	4.19	34.752	3.96	2.11				50.7	1200	4.19	34.750	3.95	27.589	50.8	1.303			
1505	3.83	34.888	4.83	1.70				36.9	1500	3.84	34.885	4.82	27.734	37.1	1.473			
1508	3.845	34.886						37.2										

Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	MESSINGER TIME						WEATHER	DOMINANT WAVES					
									MO/DAY/YR	11/11/68	1612	BOTTOM	5103M	WIND	220	SPEED	08KT	1	190	04	08
0	24.85	35.879	4.91	.21	1.1	.00	0.3	385.1	0	24.85	35.879	4.91	24.071	385.1	1.67	26.257	177.1	0			
8	24.47	35.887	4.96	.19	.01	0.2	373.6	10	24.41	35.863	4.97	24.194	373.5	0.75	24.226	370.4	.038				
13A	24.33	35.558U	4.97	.20	1.2	.00	0.3		20	24.28	35.854	4.97	24.226	370.4	.075						
22B	24.26	35.863	4.97					369.3	30	23.36	35.787	5.03	24.447	349.3	.111						
32B	23.13	35.770	5.05	.18	1.7	.00	1.9	344.3	50	15.68	35.545	1.67	26.257	177.1	.164						
41C	16.66	35.609	2.57	1.23	5.9	.28	7.7	194.0	75	14.42	35.287	1.74	26.338	169.5	.208						
47A	15.92	35.183U	2.10	1.40	6.9	.31	21.4		100	13.74	35.430	1.93	26.418	161.9	.250						
50C	15.68	35.545	1.67					177.1	125	13.17	35.158	1.87	26.499	154.2	.290						
94A	13.90	35.275U	1.80	1.67	9.4	.03	25.3		150	12.67	35.132	1.83	26.579	146.6	.329						
100B	14.25	V 35.430	1.93						200	12.07	35.176	1.80	26.731	132.2	.401						
141A	12.90	35.396U	1.83	1.64	10.1	.01	26.3		250	11.03	35.051	1.51	26.829	122.9	.467						
188A	12.14	35.075U	1.82	1.81	.03	28.8			300	10.24	34.966	1.19	26.904	115.7	.530						
192D	12.16	35.177						133.8	400	8.80	34.818	1.24	27.028	104.0	.647						
236	11.27	35.073	1.76	1.90	12.7			125.5	500	7.32	34.671	1.16	27.134	93.9	.754						
282	10.52	35.003	1.04	2.22	15.1	.00	36.1	117.8	600	5.90	34.561	1.71	27.240	83.9	.851						
330	9.79	34.907	1.53	2.16	15.9	.00	35.0	112.9	700	5.21	34.520	2.33	27.292	79.0	.941						
378	9.19	34.842	1.29	2.35	17.8	.01	38.4	108.2	800	4.58	34.508	2.93	27.355	73.0	1.025						
389D	8.99	34.834						105.8	1000	4.21	34.598	3.40	27.465	62.6	1.179						
472	7.67	34.701	1.07	2.60	22.0	.01	42.6	96.4	1200	4.08	34.757	4.07	27.607	49.2	1.312						
567	6.41	34.597	1.51	2.75	26.4	.01	44.0	87.5	1500	3.87	34.904	4.90	27.746	36.0	1.478						
588D	6.03	34.570						84.8	2000	3.37	34.941	5.50	27.824	28.6	1.714						
711	5.18	34.519	2.40	2.75	30.7	.01	42.5	78.7	2500	2.93	34.926	5.42	27.855	25.6	1.933						
786D	4.61	34.505						73.6	3000	2.63	34.911	5.43	27.870	24.3	2.146						
830	4.53	34.517	3.07	2.49	31.3	.01	35.5	71.9	3500	2.50	34.904	5.30	27.876	23.7	2.362						
950	4.25	34.562	3.26	2.46	35.8	.01	38.0	65.6	4000	2.36	34.889	5.30	27.875	23.8	2.583						
1189	4.08	34.747	4.03	2.10	31.7	.01	32.1	50.0	4500	2.37	34.885	5.42	27.871	24.1	2.814						
1227D	4.08	34.783						47.3	5000	2.43	34.885	5.43	27.866	24.6	3.061						
1431	3.93	34.883	4.80	1.83	27.4	.01	26.5	38.3													
1516E	3.85	34.909	4.92	1.65	26.3			25.4													
1713D	3.65	34.938						31.4													
1760E	3.60	34.941	5.32	1.50	26.1			23.0													
2003E	3.37	34.941	5.50	1.46	28.9			22.2													
2249E	3.13	34.935	5.45	1.47	32.6			22.6													
2492E	2.93	34.929						25.5													
2503E	2.93	34.927	5.42	1.53	38.1			22.9													
2733E	2.78	34.921	5.45	1.56	40.8			23.2													
2946E	2.68	34.916	5.34U	1.57	43.5			23.3													
2972E	2.64	34.912	5.44	1.57	44.8			23.5													
3183F	2.56	34.908						24.0													
3192F	2.57	34.911	5.38	1.60	45.6			23.3													
3423F	2.50	34.906						23.7													
3432F	2.51	34.905	5.34	1.60	49.3			24.3													
3667F	2.41	34.898						23.5													
3677F	2.413	34.899	5.23	1.82U	53.2			24.9													
3915F	2.36	34.894	5.33					53.6													
3960E	2.36	34.890	5.30	1.76U	54.4	.00		24.5													
4194G	2.37	34.889																			
4203G	2.36	34.891	5.32	1.76U	54.6	.00		25.6													
4432G	2.36	34.886																			
4441G	2.37	34.886	5.41	1.60	52.5			24.3													
4677G	2.384	34.886																			
4687G	2.389	34.885	5.44	1.62	53.7			24.2													
4927G	2.41	34.882																			
4937G	2.425	34.887	5.45	1.60	53.1			23.7													
5014G	2.427	34.885	5.43	1.62	55.5			24.0													

- A) THE SALINITY SAMPLE BOTTLE NUMBERS ON CAST I FROM 13 TO 188 METERS, INCLUSIVE, APPEAR TO HAVE BEEN ENTERED INCORRECTLY ON THE ORIGINAL DATA SHEET. THE INTERPOLATED VALUES ARE BASED ON THE SALINITY VALUES FROM CASTS X AND XI.
- B) CAST X. XI-12-68, 0149 GMT.
- C) CAST XI. XI-12-68, 0208 GMT.
- D) CAST VII. XI-11-68, 2321 GMT.
- E) CAST IX. XI-12-68, 0048 GMT.
- F) CAST VI XI-11-68, 2151 GMT.
- G) CAST III XI-11-68, 1820 GMT.
- V) BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN DELETED FOR THE INTERPOLATION.

RV ARGO

## CIRCE EXPEDITION IX

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	LATITUDE 7 55.9S	LONGITUDE 1 37.9E	MO/DAY/YR 11/13/68	MESSENDER 003%	TIME	BOTTOM 5385M	WIND 160	SPEED 10KT	WEATHER	DOMINANT WAVES 180 04	DD				
Z	T	S	O2	P04	S103	NC2	NC3	DT	Z	T	S	UZ	SIGT	DT	DD
0	23.68	35.667	4.99	.23	4.0	.04	0.1	367.1	0	23.68	35.667	4.99	24.261	367.1	0
29	22.22	35.698	5.12	.23	4.3	.01	0.0	324.7	10	23.18	35.675	5.03	24.414	352.5	.036
36	19.36	35.677	4.30	.59	8.2	.11	5.6	252.6	20	22.67	35.686	5.08	24.567	337.9	.071
99	14.84	35.518	1.83	1.65		.01	22.9	161.3	30	21.83	35.690	5.01	24.810	314.8	.103
198		35.284							50	18.36	35.621	3.75	25.677	232.3	.158
201	12.91	35.270	1.76	1.79	12.5	.00	27.1	141.0	75	16.56	35.550	2.77	26.058	196.1	.212
247	12.31	35.204	1.78	1.84	13.5	.07	28.2	134.6	100	14.80	35.510	1.83	26.426	161.1	.258
298	11.24	35.071	1.77	2.19	14.4	.00	29.6	125.1	125	13.99	35.352	1.81	26.479	156.1	.298
345	10.31	34.972	.84	2.29	18.2	.01	34.8	116.6	150	13.41	35.262	1.79	26.531	151.2	.338
395	9.31	34.869	.76	2.58	23.4	.01	37.6	108.1	200	12.91	35.267	1.76	26.636	141.2	.413
444		34.785							250	12.25	35.196	1.78	26.711	134.0	.485
447	8.39	34.769	1.17	2.56	22.4			101.6	300	11.20	35.066	1.73	26.810	124.7	.553
494	7.70	34.707	1.19	2.70	24.3	.00	40.2	96.4	400	9.22	34.858	.80	26.992	107.4	.677
535	7.03	34.705U	1.43	2.66	26.6	.00	40.2		500	7.60	34.698	1.22	27.116	95.7	.787
590	6.26	34.585	1.68	2.76	28.7	.00	41.2	86.5	600	6.12	34.573	1.74	27.220	85.9	.886
690	5.40	34.523	2.30	2.80	33.0	.00	39.2	80.9	700	5.37	34.526	2.34	27.277	80.4	.977
693	5.398								800	4.75	34.510	2.71	27.337	74.7	1.064
789	4.80	34.508	2.66	2.84	33.2	.00	38.4	75.4	1000	4.17	34.599	3.51	27.471	62.1	1.219
983	4.19	34.586	3.45	2.48	36.5	.00	35.5	63.2	1200	4.05	34.746	4.12	27.601	49.8	1.351
1178	4.06	34.736	4.04	2.10	41.0	.00	32.2	50.6	1500	3.84	34.924	5.03	27.764	34.3	1.515
1475	3.86	34.904	4.98	1.86	28.5	.00	26.0	36.0							
1478	3.858	34.907						35.8							

RV ARGO

## CIRCE EXPEDITION IX

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	LATITUDE 7 26.7S	LONGITUDE 1 40.3W	MO/DAY/YR 11/16/68	MESSENDER 0327	TIME	BOTTOM 3556M	WIND 150	SPEED 13KT	WEATHER	DOMINANT WAVES 150 05 07	DD				
Z	T	S	O2	P04	S103	NC2	NC3	DT	Z	T	S	O2	SIGT	DT	DD
0	23.53	35.788	4.97			354.2	0	23.53	35.788	4.97	24.396	354.2	0		
49	22.35	35.874	4.77			315.5	10	23.29	35.804	4.93	24.479	346.3	.035		
69	19.93	35.851	3.63			254.1	20	23.05	35.821	4.89	24.562	338.4	.069		
99	14.79	35.495	1.82			162.0	30	22.81	35.838	4.85	24.645	330.5	.103		
198		35.109					50	22.25	35.875	4.72	24.831	312.8	.168		
201	11.53	35.100	1.89			128.1	75	18.90	35.774	3.24	25.657	234.2	.236		
247	10.64	34.997	2.02			120.2	100	14.76	35.490	1.82	26.421	161.6	.287		
297	9.94	34.915	1.92			114.7	125	13.96	35.381	1.84	26.508	153.3	.327		
347	9.39	34.859	1.81			110.1	150	13.16	35.280	1.86	26.596	145.0	.365		
396	8.75	34.789	1.81			105.5	200	11.56	35.103	1.89	26.771	128.4	.436		
399		34.727					250	10.59	34.991	2.02	26.861	119.9	.500		
448	8.10	34.722	1.78			100.9	300	9.91	34.911	1.91	26.918	114.4	.562		
495	7.54	34.682	1.71			96.0	400	8.70	34.783	1.81	27.016	105.1	.679		
536	7.06	34.640	1.58			92.7	500	7.48	34.678	1.69	27.117	95.6	.787		
592	6.35	34.580	1.93			88.0	600	6.25	34.575	1.98	27.205	87.3	.887		
691	5.368	34.520	2.51			80.8	700	5.31	34.516	2.57	27.277	80.4	.980		
695	5.342	34.518				80.6	800	4.65	34.499	3.15	27.340	74.4	1.066		
791	4.69	34.498	3.11			75.0	1000	4.15	34.595	3.72	27.470	62.2	1.220		
987	4.15	34.583	3.69			63.0	1200	4.09	34.747	4.11	27.598	50.0	1.353		
1182	4.10	34.738	4.06			50.9	1500	3.91	34.907	5.01	27.743	36.3	1.521		
1481	3.912	34.899	4.95												
1484	3.912	34.897					37.0								

	LATITUDE 7 47.1S	LONGITUDE 6 09.0W	MO/DAY/YR 11/18/68	MESSANGER 0733	TIME	BOTTOM 4605M	WIND 150	SPEED 16KT	WEATHER 2	DOMINANT WAVES 140 05 08						
Z	T	S	02	P04	S103	NC2	NO3	DT	Z	T	S	02	S107	DT	DD	
0	24.13	36.001	4.74	.18	1.3	.00	0.0	355.7	0	24.13	36.001	4.91	24.380	355.7	0	
17	23.45	36.176	4.94	.16	0.9	.01	0.0	323.9	10	23.70	36.118	4.93	24.598	335.0	.035	
45	22.94	36.194	5.00	.17	1.1	.01	0.0	308.5	20	23.40	36.164	4.95	24.721	323.3	.068	
70	18.73	35.892	3.52	.90	3.7	.32	10.0	221.6	30	23.21	36.148	4.97	24.762	319.3	.100	
99	15.47	35.592	2.70	1.40	6.2	.06	18.8	169.2	50	22.19	36.134	4.73	25.045	292.4	.161	
149	12.09	35.171	2.36	1.67	9.8	.01	25.6	133.0	75	18.07	35.836	3.33	25.913	209.9	.225	
198	10.98	35.036	2.47	1.84	11.2	.01	27.7	123.2	100	15.38	35.581	2.69	26.353	168.0	.273	
203A	10.52	V 34.981V							125	13.39	35.350	2.52	26.502	144.4	.312	
248	10.21	34.947	2.28	2.02	13.3	.00	29.6	116.8	150	12.05	35.167	2.36	26.727	132.6	.348	
297	9.74	34.893	2.07	2.11	14.6	.01	32.3	113.1	200	10.94	35.032	2.47	26.829	122.9	.414	
347	9.22	34.839	1.88	2.25	16.1	.00	34.8	108.9	250	10.19	34.944	2.27	26.895	116.6	.476	
396	8.73	34.788	1.90	2.36	17.4	.01	36.2	105.2	300	9.71	34.889	2.06	26.935	112.9	.537	
400A	8.51	V 34.763V							400	8.68	34.783	1.89	27.019	104.9	.653	
494	7.39	34.664	1.76	2.60	21.6	.01	39.3	95.3	500	7.30	34.657	1.78	27.127	94.6	.760	
592	5.99	34.555	2.29	2.71	25.9	.00	40.8	85.5	600	5.91	34.549	2.35	27.229	85.0	.858	
597A	6.02	V 34.554							700	5.17	34.496	3.02	27.278	80.3	.949	
689	5.24	34.500	2.97	2.64	28.6	.00	38.2	80.8	800	4.61	34.485	3.39	27.333	75.1	1.035	
786	4.68	34.484	3.35	2.61	31.5	.00	37.8	75.9	1000	4.16	34.600	3.70	27.472	62.0	1.190	
794A	4.70	V 34.485V							1200	4.11	34.744	4.11	27.592	50.6	1.324	
883	4.29	34.510	3.57	2.55	33.8	.00	37.0	69.9	1500	3.89	34.910	5.08	27.748	35.8	1.492	
981	4.17	34.583	3.67	2.50	34.4	.01	35.5		2000	3.36	34.937	5.59	27.822	28.8	1.728	
1238A	4.10	34.767							48.7	2500	2.96	34.920	5.55	27.848	26.4	1.950
1248A	4.09	34.772	4.24	2.17	29.5	.00	30.4		3000	2.62	34.904	5.52	27.865	24.7	2.166	
1483A	3.92	34.907							36.4	3500	2.44	34.896	5.52	27.874	23.9	2.382
1493A	3.90	34.909	5.06	1.66	24.2		24.9		36.0	4000	2.34	34.889	5.62	27.876	23.7	2.602
1724A	3.66	34.944							31.1	4500	2.32	34.883	5.64	27.873	23.9	2.831
1734A	3.64	34.944	5.46	1.52	23.7		22.6		30.9							
1964A	3.43	34.945														
1973A	3.41	34.940	5.58	1.52	27.4		22.5									
2197A	3.14	34.934	5.64		30.2		22.2									
2333B	3.12	34.932	5.50						27.0							
2436B	3.01	34.925	5.57	1.56	34.0		23.1									
2668B	2.81	34.916	5.51						25.5							
2677B	2.80	34.916	5.52	1.60	38.8		22.6									
2909B	2.65	34.909	5.50						24.7							
2918B	2.65	34.906	5.50	1.61	41.5		23.6									
3151B	2.56	34.903	5.55						24.4							
3160B	2.56	34.901	5.56	1.66	43.0		23.6									
3387C	2.47	34.903	5.49						23.6							
3393B	2.48	34.896	5.43V	1.63	46.2		23.5									
3576C	2.42	34.897	5.54	1.62	46.3		23.7									
3672C	2.40	34.895	5.51	1.63	48.2		23.7									
3767C	2.39	34.894	5.55						23.7							
3862C	2.37	34.892	5.59	1.68	48.6		23.9									
3882B	2.358	34.891	5.65V						23.6							
3958C	2.35	34.889	5.62	1.72	49.3		23.9									
4055C	2.34	34.890	5.61	1.65	49.5		23.9									
4104C	2.34	34.886	5.64						23.9							
4152C	2.33	34.896	5.60	1.67	50.4		23.6									
4201C	2.33	34.889	5.70U	1.65	49.5		23.9									
4250C	2.331	34.886	5.63	1.61	49.6		23.8									
4297C	2.326	34.884	5.64	1.66	49.3		24.0									
4325B	2.335	34.882	5.64						24.1							
4347C	2.312	34.885	5.62						23.7							
4396C	2.318	34.883	5.62	1.68	51.1		23.9									
4446C	2.325	34.882	5.65	1.69	50.5		24.3									

A) CAST VI. XI-18-68, 0555 GMT.

B) CAST IV. XI-18-68, 0341 GMT.

C) CAST II. XI-18-68, 0058 GMT.

VI BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN

DELETED FOR THE INTERPOLATION.

RV ARGO

## CIRCE EXPEDITION IX

230

	LATITUDE 8 10.3S	LONGITUDE 9 01.5W	MO/DAY/YR 11/21/68	MESSANGER 1034	TIME	BOTTOM 3804M	WIND 130	SPEED 13KT	WEATHER Z	DOMINANT WAVES 120 05 10						
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD	
0	24.13	36.043	4.93	.23	3.8	.00	0.4	352.7	0	24.13	36.043	4.93	24.412	352.7	0	
58	23.59	36.227	5.02	.23	3.1	.00	0.2	324.2	10	24.04	36.074	4.95	24.463	347.8	.035	
78	22.34	36.297	4.73	.33	3.2	.06	1.1	284.7	20	23.94	36.105	4.96	24.515	342.9	.070	
99	20.60	36.187	4.23	.58	4.5	.33	11.6	246.8	30	23.85	36.137	4.98	24.567	337.9	.104	
201		35.087							50	23.66	36.201	5.01	24.670	328.1	.171	
204	11.28	35.073	2.16	1.97	12.3	.00	27.5	125.7	75	22.56	36.291	4.78	25.059	291.0	.249	
250	10.15	34.943	2.01	2.06	16.4	.01	31.0	116.1	100	20.49	36.172	4.20	25.543	245.1	.317	
301	9.55	34.874	1.86	2.22	16.1			33.6	111.5	125	17.90	35.849	3.57	25.963	205.1	.374
350	8.96	34.809	1.98	2.32	17.3	.00	34.1	107.2	150	15.55	35.575	3.03	26.309	172.2	.422	
400	8.47	34.763	1.91	2.40	20.5	.01	35.7	103.2	200	11.56	35.108	2.21	26.776	128.0	.499	
450		34.712							250	10.15	34.943	2.01	26.901	116.1	.563	
453	7.93	34.705	2.10	2.47	21.0	.01	36.5	99.7	300	9.56	34.874	1.86	26.948	111.6	.623	
501	7.48	34.667	2.10	2.56	22.8	.01	36.6	96.3	400	8.47	34.763	1.91	27.036	103.2	.737	
542	6.92	34.623	2.09	2.66	23.9	.00	38.0	92.1	500	7.49	34.668	2.10	27.108	96.4	.845	
600	6.24	34.569	2.36	2.71	26.2	.00	39.8	87.5	600	6.24	34.569	2.36	27.203	87.5	.946	
701	5.30	34.512	2.85	2.78	29.6	.01	38.9	80.6	700	5.31	34.514	2.84	27.275	80.6	1.038	
703	5.262	34.505						80.7	800	4.60	34.487	3.38	27.335	74.9	1.124	
801	4.60	34.488	3.39		33.6	.00	38.2	74.8	1000	4.07	34.571	3.96	27.460	63.1	1.280	
1000	4.067	34.571	3.96	2.56	41.3	.01	35.3	63.1	1200	4.01	34.744	4.21	27.603	49.6	1.413	
1197	4.01	34.743	4.20	2.32	40.4	.01	30.3	49.6	1500	3.82	34.917		27.760	34.6	1.577	
1497	3.80	34.909	5.16	1.93	33.4	.02	23.0	35.0								
1500	3.821	34.917						34.6								

RV ARGO

## CIRCE EXPEDITION IX

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	LATITUDE 8 22.2S	LONGITUDE 13 18.4W	MO/DAY/YR 11/26/68	MESSANGER 0507	TIME	BOTTOM 2988M	WIND 120	SPEED 10KT	WEATHER	DOMINANT WAVES 140 05 10					
Z	T	S	O2	P04	S103	N02	N03	DT	Z	T	S	O2	SIGT	DT	DD
0	24.93	35.953	4.83	.21	1.1	.01	0.0	382.1	0	24.93	35.953	4.83	24.103	382.1	0
59	24.94	35.944	4.70	.19	1.3	.01	0.0	383.1	10	24.93	35.951	4.81	24.101	382.3	.038
83	23.89	36.088	4.83	.20	1.5	.04	0.4	342.6	20	24.93	35.949	4.79	24.100	382.5	.077
103	22.12	36.122	4.40	.37	2.2	.14	3.0	291.4	30	24.94	35.948	4.76	24.098	382.6	.115
118	17.79	35.853	3.41	2.20A	4.7	.10	12.8	202.1	50	24.94	35.945	4.72	24.095	382.9	.192
148	16.02	35.691	3.13	1.18	6.1	.14	16.2	173.9	75	24.34	36.041	4.79	24.349	358.7	.285
168	13.98	35.424	2.68	1.46	7.2	.03	21.2	150.6	100	22.56	36.137	4.51	24.943	302.1	.369
220	10.27	34.950	2.33	1.97	13.0	.01	29.4	117.5	125	17.38	35.811	3.34	26.064	195.5	.432
242B	9.95	34.916						114.8	150	15.82	35.665	3.09	26.317	171.5	.479
293	8.99	34.807	2.04	2.21	16.4	.03	33.8	107.8	200	11.32	35.080	2.39	26.799	125.7	.555
343	8.36	34.742	2.23	2.30	18.0	.01	35.0	103.2	250	9.80	34.898	2.16	26.926	113.7	.618
392	7.91	34.705	2.12	2.41	19.7	.02	37.2	99.5	300	8.89	34.796	2.07	26.996	107.0	.676
437B	7.67	34.685						97.6	400	7.87	34.702	2.13	27.080	99.1	.785
489	7.18	34.634	2.22	2.50	22.0	.00	39.9	94.7	500	7.07	34.625	2.24	27.135	93.9	.890
586	6.18	34.559	2.46	2.60	24.7	.01	39.2	87.5	600	6.05	34.548	2.50	27.211	86.7	.988
632B	5.76	34.527						84.8	700	5.25	34.506	2.87	27.276	80.5	1.080
684	5.38	34.511	2.80	2.62	28.9	.01	38.7	81.6	800	4.59	34.496	3.28	27.344	74.1	1.165
782	4.67	34.494	3.22	2.65	33.2	.05	38.8	75.1	1000	4.08	34.597	3.88	27.479	61.3	1.319
827B	4.48	34.502						72.5	1200	4.02	34.715	4.12	27.579	51.8	1.452
881	4.25	34.529	3.55	2.57	35.0	.01	37.4	68.1	1500	3.89	34.896	5.09	27.738	36.8	1.623
982	4.08	34.587	3.86	2.40	35.7	.00	35.5	62.0	2000	3.18	34.923	5.55	27.828	28.3	1.858
1199C	4.02	34.714	4.12	2.09	32.5			51.9	2500	2.90	34.912	5.59	27.847	26.4	2.075
1267B	4.06	34.793						46.3							
1396C	3.99	34.864	4.78	1.72	26.6			27.0	40.3						
1511B	3.87	34.900						36.4							
1594C	3.64	34.926	5.30	1.50	25.5			22.6	32.2						
1756B	3.43	34.928						30.1							
1791C	3.41	34.927	5.43	1.50	28.4			22.8	30.0						
1988C	3.19	34.922	5.55	1.55	32.2			22.8	28.4						
2000B	3.11	V 34.923													
2185C	3.04	34.917	5.57	1.50	34.1			23.0	27.4						
2284C	3.01	34.915	5.60	1.51	35.9			23.2	27.3						
2382C	2.97	34.919	5.59	1.55	34.7			22.9	26.6						
2479C	2.90	34.911	5.60	1.55	36.7			22.8	26.6						
2492B	2.90	34.913							26.5						
2576C	2.82	34.907	5.57	1.61	38.3			23.1	26.3						
2674C	2.71	34.905	5.64	1.61	40.3			23.2	25.5						
2688B	2.74	34.905							25.7						
2722C	2.70	34.903	5.63	1.62	40.8			23.3	25.5						
2770C	2.712	34.903	5.62	1.64	40.8			23.2	25.6						
2819C	2.68	34.902	5.62	1.61	40.9			23.0	25.4						
2866C	2.66	34.900	5.64	1.61	41.4			22.7	25.4						
2914C	2.654	34.906	5.64	1.63	41.9			23.2	24.9						
2962C	2.64	34.904	5.64	1.57	43.1			23.0	25.0						

AI THE VALUE DETERMINED FROM A REPPLICATE SAMPLE WAS 2.08. THE SAMPLE WAS PROBABLY CONTAMINATED.

BI LAST IV. XI-26-68, 0306 GMT.

CI CAST II. XI-26-68, 0103 GMT.

VI BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN

DELETED FOR THE INTERPOLATION.

	LATITUDE 7 08.9S	LONGITUDE 21 21.1W	MO/DAY/YR 11/29/68	MESSINGER 1013	TIME	BOTTOM 5365M	WIND 120	SPEED 14KT	WEATHER 1	DOMINANT WAVES 130 03 10					
Z	T	S	O2	P04	SiO3	No2	No3	Dt	Z	T	S	O2	SIGT	Dt	DD
0	25.95	36.080	4.76	.20	0.6	.00	0.2	403.0	0	25.95	36.080	4.76	23.884	403.0	0
50	25.89	36.076						401.5	10	25.94	36.079	4.77	23.887	402.7	.040
99	22.48	36.616	4.81					265.5	20	25.93	36.078	4.77	23.891	402.4	.081
124	19.28	36.173	3.83	.71	2.4	.05	7.6	214.6	30	25.91	36.077	4.78	23.894	402.1	.121
143	15.96	35.625	2.54					177.4	50	25.89	36.076	4.79	23.900	401.5	.202
163	13.90	35.379	2.23	1.52	7.6	.04	23.8	152.3	75	24.59	36.439	4.80	24.572	337.4	.295
221	10.91	35.063	2.25	1.81	10.9	.05	28.8	120.0	100	22.37	36.605	4.78	25.351	263.3	.371
226		35.019							125	19.10	36.140	3.76	25.885	212.5	.431
292	9.64	34.879	2.09	2.08	13.6	.01	32.6	112.6	150	15.13	35.517	2.36	26.360	167.4	.480
382	8.28	34.740	1.89	2.31	19.4	.00	39.0	102.2	200	11.63	35.142	2.24	26.787	126.9	.556
450		34.741U							250	10.22	34.947	2.20	26.892	116.9	.619
453	7.51	34.666	2.09	2.41	19.1	.01	39.0	96.8	300	9.50	34.863	2.06	26.948	111.6	.679
500	7.10	34.632	2.24	2.45	20.8	.00	38.4	93.8	400	8.06	34.719	1.92	27.064	100.6	.792
542	6.66	34.592	2.47	2.47	21.6	.01	40.1	91.0	500	7.10	34.632	2.24	27.136	93.8	.897
598	6.12	34.554	2.60	2.52	23.6	.00	39.2	87.1	600	6.10	34.552	2.60	27.207	87.0	.996
698	5.34	34.497						82.2	700	5.33	34.494	2.86	27.257	82.3	1.089
701	5.327	34.493	2.86A	2.54	25.3	.00	38.7	82.3	800	4.57	34.544	3.13	27.384	70.2	1.174
798	4.58	34.544	3.12A	2.49	26.8	.00	38.2	70.4	1000	4.06	34.573	3.83	27.462	62.9	1.324
996	4.06	34.569	3.82	2.35	33.7	.01	36.2	63.2	1200	4.19	34.765	4.30	27.601	49.7	1.458
1192	4.19	34.762	4.28	2.08	28.0	.00	30.4	50.0	1500	4.10	34.940	5.12	27.750	35.6	1.626
1491	4.10	34.935						36.0	2000	3.36	34.946	5.74	27.829	28.1	1.862
1494	4.100	34.939			1.62	20.0	.00	23.7	2500	2.89	34.918	5.67	27.852	25.9	2.080
1670B	3.89	34.968	5.56	1.47	18.7	.00	22.1	31.5	3000	2.66	34.908	5.71	27.865	24.7	2.295
1755B	3.75	34.967	5.73	1.48	18.9	.04	21.2	30.2	3500	2.53	34.911	5.94	27.879	23.4	2.512
1765B	3.75	34.963						30.5	4000	1.82	34.839	5.68	27.879	23.5	2.721
1860B	3.58	34.963	5.75	1.47	20.3	.03	21.2	28.9	4500	.93	34.742	5.28	27.864	24.9	2.903
1954B	3.44	34.952	5.74	1.42	22.0	.00	22.1	28.4	5000	.75	34.718	5.27	27.857	25.5	3.066
2134B	3.22	34.940	5.75	1.46	26.8	.00	22.4	27.3							
2144B	3.22	34.938						27.4							
2381B	2.96	34.921	5.68		32.5	.00	10U	22.4							
2607B	2.83	34.918	5.66	1.47	35.9	.00	22.0	21.8							
2616B	2.81	34.913						25.5							
2852B	2.70	34.908	5.62	1.53	38.4	.01	21.3	25.2							
3081B	2.65	34.911	5.76	1.48	37.8	.01	21.6	24.5							
3086B	2.65	34.910						24.6							
3180B	2.61	34.909	5.76	1.48	37.5		22.0	24.3							
3271B	2.60	34.913	5.89	1.46	35.1		21.4	23.9							
3364B	2.56	34.918	5.91	1.46	35.3		21.3	23.2							
3457B	2.543	34.913	5.95	1.47	35.4		21.4	23.5							
3550B	2.494	34.909						23.4							
3644C	2.40	34.899	5.86	1.50	40.5		22.1	23.4							
3877C	2.12	34.869						23.4							
3886C	2.09	34.869	5.78	1.55	51.9		23.7	23.2							
4129C	1.59	34.814	5.56	1.89	70.7		27.0	23.7							
4363C	1.04	34.759						24.2							
4372C	1.03	34.755	5.35	2.11	92.6		30.3	24.5							
4615C	.87	34.732	5.25	2.18	101.1		31.5	25.2							
4845C	.77	34.748U													
4854C	.77	34.719	5.25	2.21	105.2		31.9	25.6							
5031C	.74	34.718						25.5							
5041C	.74	34.718	5.27	2.26	106.9		32.3	25.5							
5124C	.74	34.716						25.7							
5134C	.74	34.716	5.22	2.14D	109.		32.7	25.7							
5216C	.74	34.717						25.6							
5225C	.747	34.715	5.20	2.21	108.5		32.7	25.8							
5307C	.74	34.712	5.33	2.28	107.2		32.7	26.0							
5316C	.747	34.718						25.6							

- A) THE OXYGEN AND NUTRIENT VALUES FOR THESE TWO LEVELS HAVE BEEN REVERSED, CORRECTING A PROBABLE MIXUP DURING SAMPLING.  
 B) CAST II. XI-29-68, 0832 GMT.  
 C) CAST I. XI-29-68, 0601 GMT.  
 D) THE PHOSPHATE AND SILICATE VALUES AT THIS DEPTH ARE SOMEWHAT SUSPECT.

## CIRCE EXPEDITION IX

Z	T	S	O2	PO4	SiO3	NO2	NO3	DT	MESSINGER TIME						WEATHER	DOMINANT WAVES				
									MO/DAY/YR	12/01/68	1701	BOTTOM	4893M	WIND	120	14Kt	1	140	04	06
0	27.11	35.914	4.70	.08	0.9	.00	0.2	450.0	0	27.11	35.914	4.70	23.392	450.0	0					
56	26.87	35.907	4.73						10	27.07	35.912	4.71	23.404	448.8	.045					
96	23.58	36.546	4.63	.23	1.4	.04	0.3	300.9	20	27.02	35.911	4.71	23.417	447.5	.090					
116	19.93	36.117	3.50	1.00	2.7	.16	9.2	234.8	30	26.98	35.910	4.72	23.430	446.3	.135					
139	16.69	35.775	3.21	.97	4.5	.04	14.6	182.6	50	26.90	35.907	4.73	23.456	443.9	.224					
156	14.96	35.545	3.15	1.06	5.6	.08	16.9	161.9	75	25.80	36.312	4.68	24.106	381.9	.328					
188	12.64	35.230	3.10					138.8	100	22.87	36.469	4.60	25.104	286.8	.412					
201A	11.68	35.116						129.6	125	18.54	35.971	3.39	25.898	211.2	.476					
216	10.56	34.976	2.63	1.70	11.3	.02	27.3	120.4	150	15.52	35.623	3.16	26.354	168.0	.524					
249	9.96	34.898	2.71	1.70	12.5	.01	28.3	116.3	200	11.75	35.125	2.89	26.751	130.3	.601					
286	9.33	34.830	2.70	1.85	13.9	.03	30.0	111.3	250	9.94	34.895	2.71	26.900	116.2	.665					
374		34.706	2.59	2.01	16.9	.00	33.9		300	9.10	34.805	2.67	26.971	109.5	.725					
392A	7.69	34.669						99.1	400	7.59	34.660	2.64	27.087	98.4	.835					
443	7.04	34.608	2.78		19.7	.00	35.3	94.8	500	6.19	34.543	2.95	27.189	88.8	.936					
489	6.27	34.549	2.93	2.28	22.4	.00	36.7	89.3	600	5.48	34.494	3.28	27.240	84.0	1.029					
530	6.03	34.531	3.02					87.7	700	4.79	34.471	3.53	27.302	78.0	1.118					
582A	5.54	34.495						84.6	800	4.42	34.493	3.75	27.360	72.5	1.201					
591	5.53	34.496	3.24	2.31	24.6	.02	36.4	84.4	1000	4.19	34.611	3.88	27.477	61.4	1.353					
637	5.164	34.482	3.42					81.3	1200	4.24	34.780	4.25	27.608	49.1	1.485					
686	4.857	34.471	3.50	2.36	29.1	.00	36.8	78.8	1500	4.27	34.938	5.23	27.729	37.6	1.656					
776A	4.43	V 34.476V	3.73	2.43	31.5	.02	36.2	73.5	2000	3.48	34.950	5.87	27.821	28.9	1.902					
782	4.47	34.487	3.73	2.43	31.5	.02	36.2	73.5	2500	2.94	34.920	5.88	27.849	26.2	2.124					
971A	4.17	V 34.585V							3000	2.69	34.922	5.90	27.873	23.9	2.340					
976	4.19	34.589	3.85	2.28	32.8	.01	34.9	63.0	3500	2.56	34.915	6.06	27.879	23.4	2.556					
1172	4.23	34.756	4.18	2.02	28.7	.01	31.0	50.8	4000	1.87	34.842	5.77	27.878	23.5	2.766					
1477	4.32	34.941	5.14	1.47	20.5	.02	23.9	37.8	4500	1.01	34.750	5.37	27.864	24.8	2.950					
1507B	4.26	34.937	5.25	1.49	18.2		22.8	37.5												
1605B	4.06	34.943	5.38	1.46	18.8		22.1	35.0												
1752B	3.88	34.956																		
1802B	3.80	34.960	5.79	1.41	17.6		20.8	31.2												
1998B	3.48	34.951	5.87																	
2008B	3.492	34.948																		
2234B	3.19	34.938	5.90	1.39	24.0		21.0	27.2												
2483B	2.964	34.921																		
2492B	2.95	34.922	5.88	1.47	28.7		21.5	26.2												
2675B	2.84	34.914	5.84	1.39	30.1		21.3	25.9												
2769B	2.77	34.898	5.80	1.49	33.2		21.9	26.5												
2863B	2.77	34.911	5.86	1.44	31.8		21.4	25.5												
2954B	2.71	34.925	5.92	1.48	31.8		21.3	24.0												
3005C	2.69	34.923	5.90	1.41	31.8		21.2	23.9												
3104C	2.66	34.921	5.88	1.44	32.0		21.3	23.8												
3202C	2.64	34.920	5.95	1.42	31.1		20.7	23.8												
3203B	2.63	34.901U																		
3301C	2.62	34.918	5.96	1.35	31.4		20.6	23.7												
3400C	2.59	34.917	5.98	1.43	31.1		20.6	23.6												
3454D	2.55	34.896U																		
3498C	2.56	34.916	6.06	1.36	30.5		20.3	23.4												
3595C	2.49	34.916	6.06	1.40	31.7		20.6	22.8												
3704D	2.37	34.882U																		
3745C	2.32	34.894	6.03	1.51	37.2		21.2	23.1												
3954D	1.99	34.840U																		
3996C	1.88	34.844	5.77	1.73	56.9		24.6	23.5												
4179D	1.43	34.774U																		
4232C	1.33	34.788	5.53	1.88	78.3		27.3	23.9												
4301D	1.20	34.750U																		
4446D	1.03	34.709U																		
4473C	1.02	34.751	5.38	2.28E	91.6		30.8	24.7												
4542D	.984	34.703U																		
4569C	.94	34.740	5.34	2.23E	95.8		31.5	25.1												
4638D	.864	34.689U																		
4666C	.82	34.725	5.28	2.32E	100.9		32.1	25.5												
4761C	.717	34.714	5.26	2.45E	104.7		33.3	25.7												
4770C	.69	34.710																		
4856C	.640	34.703																		
4860C					2.52E	108.6		33.2												

A) CAST VII. XII-01-68, 1459 GMT.

B) CAST VI. XII-01-68, 1340 GMT.

C) CAST II. XII-01-68, 0850 GMT.

D) CAST IV. XII-01-68, 1126 GMT. COMPARISON OF THE DATA FOR THIS STATION AND STATION 245

INDICATES A BIAS IN THE SALINITY VALUES FOR CAST IV.

E) THESE SAMPLES WERE COLLECTED IN NON-STANDARD NUTRIENT SAMPLER BOTTLES. THE SAMPLES MAY HAVE

BEEN CONTAMINATED SLIGHTLY CAUSING WHAT APPEARS TO BE HIGH PHOSPHATE CONCENTRATIONS.

V) BECAUSE OF TIME DIFFERENCES, OVERLAPPING CASTS SHOW SOME DIFFERENCES. THIS SAMPLE HAS BEEN

DELETED FOR THE INTERPOLATION.

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